REFERENCE FILE

Spreckels SUGAR BEET Bulletin

VOLUME XII 1948

DEMCO
FOR REFERENCE
Do Not Take From This Room

MAR 1977
SALINAS PUBLIC LIBRARY
SALINAS CALIFORNIA

LOCAL HISTORY
L

LH
338
.4766
SPR
1948

ISSUED BY SPRECKELS SUGAR COMPANY . . . ESTABLISHED 1897

AGRICULTURAL DEPARTMENT—SPRECKELS SUGAR COMPANY

Addresses and Telephone Numbers

NAME	TITLE	ADDRESS	TELEPHONE
		SALINAS DISTRICT	
George P. Wright	District Manager	**SPRECKELS**	Salinas 7321
Ralph S. Lambdin	Asst. District Manager	"	" "
William H. Paulsen	Agricultural Superintendent	"	" "
Harold H. Voth	Field Superintendent	"	" "
Robert E. Flores	Field Superintendent	"	" "
Harvey W. Parker	Field Superintendent	"	" "
Grover C. McCandless	Field Superintendent	"	" "
Henry Sevier	Superintendent of Company Ranches	"	" "
William J. Redding	Asst. Agricultural Engineer	"	" "
Walter L. Gerow	Civil Engineer	"	" "
Paul Cozzens	Asst. Civil Engineer	"	" "
W. Ben Marcum	In Charge, Plant Breeding	"	" "
J. Byron Larsen	Asst. Agricultural Superintendent	**KING CITY**	King City 72F2
Richard L. Pedder	Field Superintendent	"	" " "
		SACRAMENTO AND SOUTH SAN JOAQUIN DISTRICTS	
Hugh F. Melvin	District Manager	**SACRAMENTO** 600 California Fruit Building	Sacramento 3-2021
Guy D. Manuel	Asst. District Manager	" " " "	" "
Edward A. Schwing	Entomologist (Part Time)	" " " "	" "
Austin A. Armer	Agricultural Engineer	" " " "	" "
Julian P. Williams	Civil Engineer	" " " "	" "
P. T. Rezner	Field Superintendent	" " " "	" "
William A. Frank	Field Superintendent	" " " "	" "
John O. Nielsen	Asst. Civil Engineer	2811 Fifth Street	" 2-8525
John W. Bryan	Field Superintendent	**WALNUT GROVE** P. O. Box 35	Walnut Grove 3371
R. Bruce Duncan	Field Superintendent	**MANTECA**	Manteca 42
C. Norman Vogt	Field Superintendent	**LOS BANOS** P. O. Box 1232	Los Banos 427
Harry Venning, Jr.	Agricultural Superintendent	**WOODLAND**	Woodland 1060
Walter Buckingham, Jr.	Field Superintendent	"	" "
Donald R. Hefner	Field Superintendent	"	" "
John Kendrick	Field Superintendent	"	" "
Robt. G. Veaco	Field Superintendent	"	" "
John M. Lear	Livestock Specialist	"	" "
H. T. Carlson	Asst. Agricultural Superintendent	P. O. Box 33, Woodland	" 1046
Clark Fensler	Field Superintendent	**TULE LAKE, California**	Tulelake 2805
Mark G. Raney	Agricultural Superintendent	**BAKERSFIELD** 462 Haberfelde Building	Bakersfield 4-4904
F. Jack Hills	Field Superintendent	" " "	" "
Ray N. Talcott	Field Superintendent	" " "	" "
Ernest Unruh	General Utility	Kentucky and Tulare Streets, Bakersfield	" 3-9259

SALINAS PUBLIC LIBRARY
[redacted]

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XII JANUARY-FEBRUARY 1948 No. 1

1

THE BEET GROWER IS IN THE SUGAR BUSINESS

People don't eat sugar beets. The sugar beet grower and his processor are the partners in a business dedicated to the production and marketing of ***sugar***. The grower's profit is dependent upon:

LOW PRODUCTION COST OF SUGAR BEETS
HIGH YIELD OF SUGAR PER ACRE
THE PRICE OF SUGAR

These subjects are discussed in this issue.

HONEY-DEW

WORLD SUGAR PRODUCTION AND IMPORTANCE OF U .S. SUGAR ACT

By B. H. BENIDT

Special Assistant to the President, Spreckels Sugar Company

Although world sugar production has been increasing at a very rapid rate during the past two years, the 1947-48 crop will still be somewhat below the normal crops produced just prior to World War II. According to the U. S. Department of Agriculture's Office of Foreign Agricultural Relations, the 1947-48 crop is now estimated at 33,466,000 tons compared with the five-year (1935-1939) average of 34,787,000 tons.

WORLD SUGAR PRODUCTION — BY CONTINENTS
PREWAR AND POSTWAR PERIODS

Continent	Average 1935-39	Crop Years 1944-45	1945-46	1946-47	1947-48*
	(In thousands of short tons, raw value)				
NORTH AMERICA (Including) Caribbean)	7,801	7,947	8,938	11,434	11,423
SOUTH AMERICA	2,414	2,678	2,689	3,122	3,153
EUROPE (Excluding U.S.S.R.)	7,408	5,342	3,852	5,721	5,274
U.S.S.R. (Europe and Asia)	2,887	1,270	1,500	1,750	3,000
ASIA (Excluding U.S.S.R.)	10,890	7,165	6,753	6,928	7,477
AFRICA	1,295	1,291	1,167	1,289	1,424
OCEANIA (Including Australia, Fiji, Hawaiian Islands, Japanese Mandated Islands)	2,092	1,648	1,487	1,650	1,715
TOTAL	34,787	27,341	26,386	31,894	33,466
Beet sugar	12,011	7,920	6,882	9,258	10,453
Cane sugar	22,776	19,421	19,504	22,636	23,013

*Preliminary.

Source: Office of Foreign Agricultural Relations, U. S. Department of Agriculture.

Note: Years shown are for crop years. Generally the harvesting begins in the fall months of the first year shown or in the early months of the following year.

Approximately 2,800,000 tons of the 3,600,000-ton increase in the 1947-48 North American crop over the five-year prewar average is accounted for by increased production in Cuba, and the major portion of the other 800,000 tons by increases in the U. S. beet area and in Mexico.

Great effort has been made in most European countries to rebuild their beet sugar industry, but in addition to the difficulty of obtaining necessary fuel, fertilizer and heavy equipment, several of the European countries also suffered from a severe 1947 drought. Production in Germany is, of course, the lowest in relation to prewar.

The small 1947-48 production in Asia, as compared with prewar, is due principally to the inability of Java and Formosa to make any real progress in rehabilitating their sugar industry from the destruction and changes brought about by the Japanese during the war. Production in the Philippine Islands is also still far below prewar levels, but that country should have its sugar industry almost completely rehabilitated within a few years.

According to reliable estimates, average world consumption of sugar during the five-year prewar period totaled approximately 34,000,000 tons. Thus, even before allowing for the usual increases in total consumption resulting from increases in population, it would appear that world demand in 1948 would exceed available supply. This would be a reasonable expectation normally but in all probability will not be the case in 1948. Why? Because people's customary desires in a great many countries will not be reflected in actual demand. The people in sugar deficit countries, like Germany, Italy, France, Great Britain, Japan, and others, still desire just as much sugar as before the war, but they do not have the required foreign exchange to purchase it.

Consequently, instead of what would appear to be a world deficit of sugar, there will likely be a world surplus. The "Marshall Plan" or other forms of relief from the United States will probably increase the actual demand for sugar over what it would otherwise be, but it seems highly improbable that sufficient sugar will be involved in any such program to eliminate a probable world surplus.

IMPORTANCE OF U. S. SUGAR ACT

During periods of world surplus the U. S. Sugar Act becomes important in maintaining sugar prices in the United States, because under it surplus sugars are prohibited from entering this market. The price of sugar in the United States is entirely dependent upon the relationship of demand in the United States to the amount of sugar that is permitted to be marketed by the Secretary of Agriculture under the terms of the Sugar Act. As a general requirement the law specifies that the total supplies made available in the United States shall be in such amount that the resulting prices will fairly and equitably maintain and protect the welfare of the domestic sugar industry, but at the same time not be excessive to consumers. The Secretary of Agriculture can hardly comply with this general requirement unless he so regulates supply that sugar prices are kept in line with the U. S. price level generally.

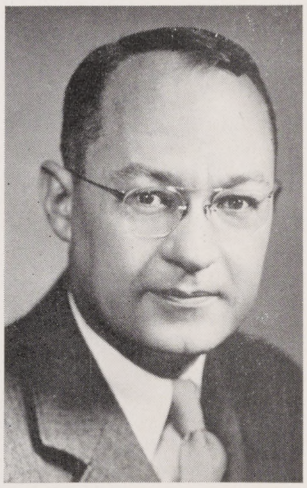
Thus, as long as the Sugar Act is in effect (the 1948 Act expires December 31, 1952), both producers and consumers in the United States should be able to look forward to sugar prices that will be in line with the general price level of all commodities regardless of the effect of world surplus sugars on the world price.

———o———

THE INDUSTRIAL UTILIZATION OF SUGAR AND BYPRODUCTS

By DR. ROBERT C. HOCKETT

Scientific Director, Sugar Research Foundation
New York, New York



2

An event of exceptional significance for the progress of carbohydrate chemistry occurred in June 1943 when the producers and processors of cane and beet sugar supplying the United States market established the Sugar Research Foundation.

The Sugar Research Foundation is a nonprofit corporation organized under the laws of New York State. The producers and processors of sugar, both beet and cane, raw and refined, for the United States market, are eligible for membership and a very large proportion of the eligible companies are now enrolled. These include beet and cane sugar producers and refiners of the continental United States, Hawaii, Cuba, and Puerto Rico. In addition, the Canadian and Haitian producers are enrolled as associate members. These members pay a self-imposed tax into the treasury to support the Foundation's program of research.

The purpose of this association is to study the "uses and possible uses of sugar, both as a food and as a constituent of foods, in industry or otherwise." It should be noted that the *production* of sugar is not included in this program. Other organizations exist in specific areas for the study of beet and cane varieties, insect pests, fungus diseases, culture methods, fertilizer, agricultural machinery, mill practices and the like. Hence these subjects, important though they are, have not been included in the Foundation's program. More recently, however, the Directors have authorized the study of beet and cane byproducts as well as sugar itself, so that the work has been broadened accordingly. At the present time, thirty-nine research projects are being carried out or have already been completed in colleges and universities of the United States and Canada.

First, let us consider the status of the beet and cane plants in the scheme of nature. The sun itself is an atomic bomb. Terrific atomic explosions within its mass are responsible for the energy which it radiates into surrounding space and of which an infinitesimal part reaches the surface of the earth. Yet, until man himself learned how to tap the atom, this energy from the sun was virtually all that was accessible to him. The green plants of the earth's surface are mainly responsible for the storage of this energy. Through the process of photosynthesis, carbon dioxide and water are combined into sugar with absorption of light from the sun. As chemical energy this light is stored up in the sugar molecules, from which it can be set free by the process of combustion. All our other organic materials are ultimately built up out of sugar through the agency of plants, animals and micro-organisms. For this reason Sinnott has said that "Plants hold the basic patents."

The sugar beet and sugar cane are both very efficient converters of solar energy into *edible* carbohydrates, each in its own characteristic habitat. This is because the juices of the whole plant become charged with sugar, whereas many other food plants store edible materials only in the seed or fruit. If the world's population continues to grow, it seems likely that plants which produce a high yield of food per acre will become increasingly important from the standpoint of land utilization.

BYPRODUCTS OF SUGAR

Therefore, assuming the basic importance of these plants, and of their major product, sugar, let us consider some of their byproducts. From sugar cane there are five byproducts worthy of mention. These are aconitic acid, wax, cellulose, xylans and molasses.

(Continued on page 6)

THE 1947 MECHANICAL HARVEST IN REVIEW

By AUSTIN ARMER

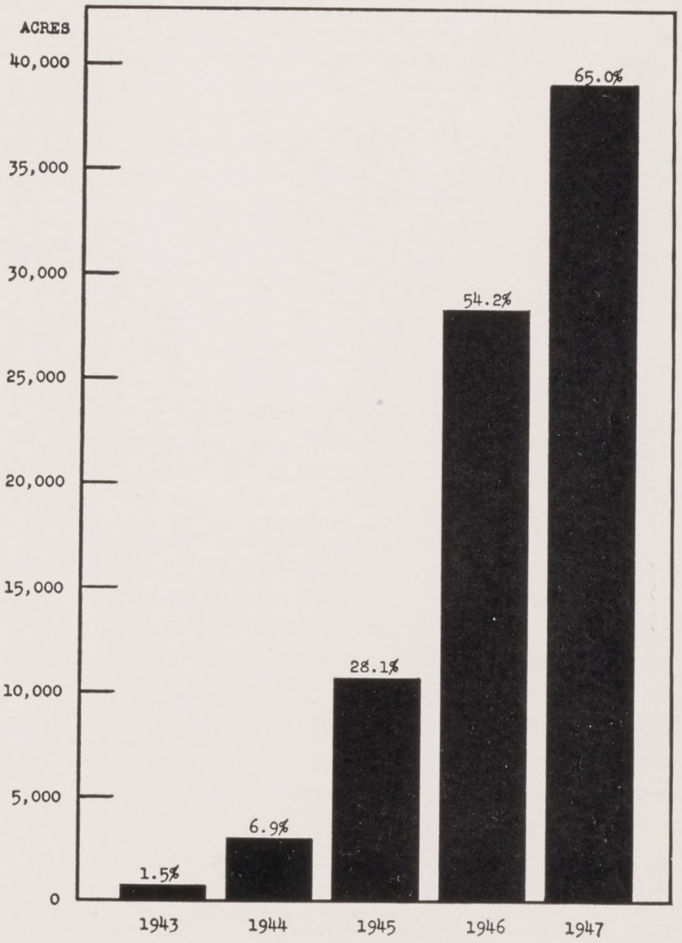
Agricultural Engineer, Spreckels Sugar Company

For the past three years readers of the *Spreckels Sugar Beet Bulletin* have seen the steady and rapid growth of mechanical harvest. They have witnessed the increase in grower acceptance as evidenced by the swelling ranks of growers owning their own harvesting machines. Each year the proportion of mechanically harvested acreage has grown, and the acreage per machine has likewise shown a marked increase.

All of these factors contributed to the record-breaking figures for 1947, but more significant than statistics is the remarkable acceptance of mechanical improvements on harvesters. The self-reliance and ingenuity displayed by owners and operators is the real story behind the 1947 record.

As this issue goes to press it is too early to compile final data on the percentage of mechanically harvested acreage in the three Spreckels districts. All indications point to a figure of over 65 per cent of the acreage mechanically harvested. This we do know, however: the acreage mechanically harvested in 1947 increased over the 1946 figures at a considerably greater rate than the

(Continued on page 4)



The 1947 acreage record for mechanical harvest points toward eventual total mechanization.

MECHANICAL HARVEST

(Continued from page 3)

increase in harvesters used. This points up the fact that acreage per machine has shown a marked upswing, especially among those machines owned by growers and commercial harvesting contractors.

The International HM1 beet harvester grew in popularity in 1947. The Ray D. Henderson Company gives the following performance tabulation for 11 machines used in the Woodland District:

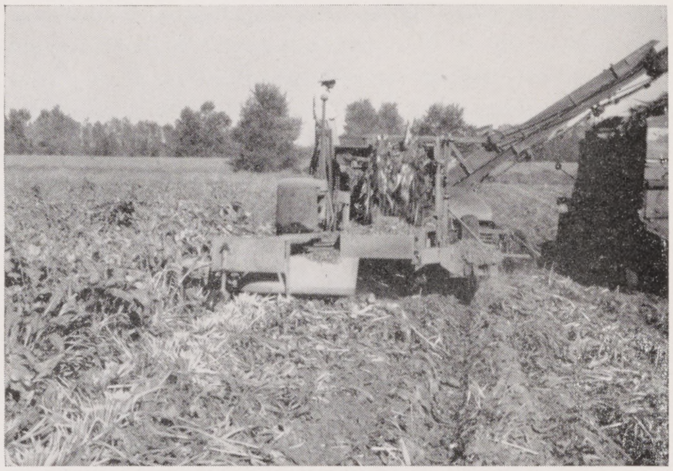
Grower	Acres Harvested	Tons Harvested
Donald Fong	105	2,557
Wallace L. Turner	76	1,166
R. L. Dunham	100	2,000
Lloyd S. Burr	35	630
G. L. Isham	80	1,200
Otto Burgdorff	24	576
Wilder Bros	100	1,950
H. B. Hayden, Jr	45	675
Heidrick Bros.	91	1,379
Martin Herzig	74	937
Wm. Brownell	60	810

The Marbeet top windrower and rear mounted coulters, described in the July-August *Sugar Beet Bulletin,* were made available by the Blackwelder Manufacturing Company, and were used with good results on a majority of Marbeet harvesters in use by Spreckels growers. The use of these accessories has greatly helped to promote the effective utilization of tops for feed—a subject which has often been stressed in these pages and which concerns most growers.

Two other devices aimed at solving the trash problem are the Olson Roto-Beater and the Lembke beater. These machines were introduced in the Woodland District and did a fine job of disintegrating heavy top and weed growth preceding harvest, both by International and Marbeet harvesters. The Lembke and Olson beaters are real utility tools. Originally designed to break up potato vines, they were adopted by Idaho beet growers as top-disintegraters. They should find ready acceptance in California, where they are a valuable tool in beet harvest. They also serve to break up tomato vines after harvest, greatly accelerating the decomposition of the vines when plowed or disked under, and preventing the vines from fouling the equipment.

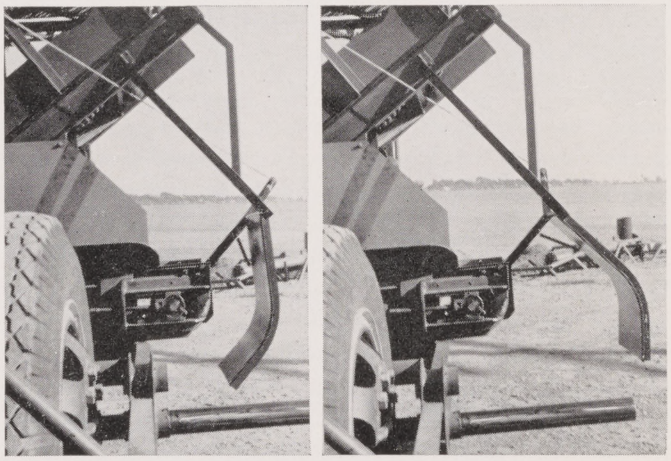
Improving the pick-up and topping quality of the Marbeet harvester was accomplished by a defoliator developed by the Spreckels Agricultural Engineering Department and built by the Blackwelder Manufacturing Company. Basically, it is a steel fan rotated by a vertical shaft. The sharpened blades cut off the tops six or eight inches above ground level, and the upward air movement from the spinning fan blows the tops into a deflecting shield and deposits them on harvested ground.

There remains much refinement in harvester performance yet to be accomplished. Machine operators still hold the major responsibility in accomplishing efficient, low cost harvest. But the Spreckels Sugar Company is mindful of its responsibility and will continue its active effort toward improving harvester performance.



4

The Spreckels-designed Marbeet Defoliator facilitates harvest in excessively heavy top growth.

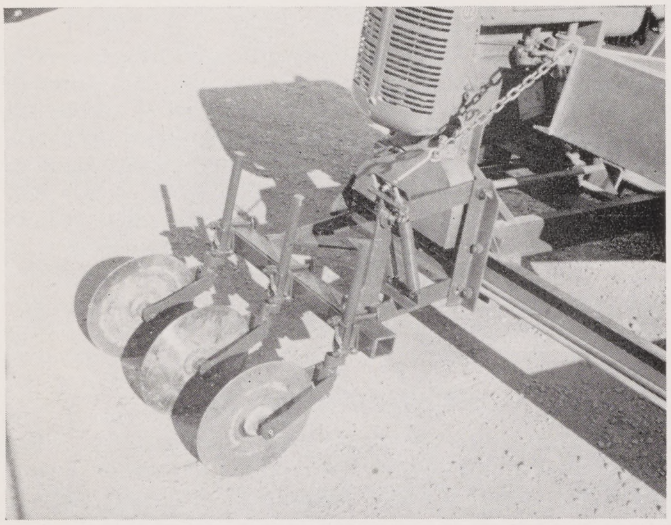


5

The Spreckels-designed top windrowing attachment for the two-row Marbeet harvester enables trucks to straddle top windrows and enhances top feed value.

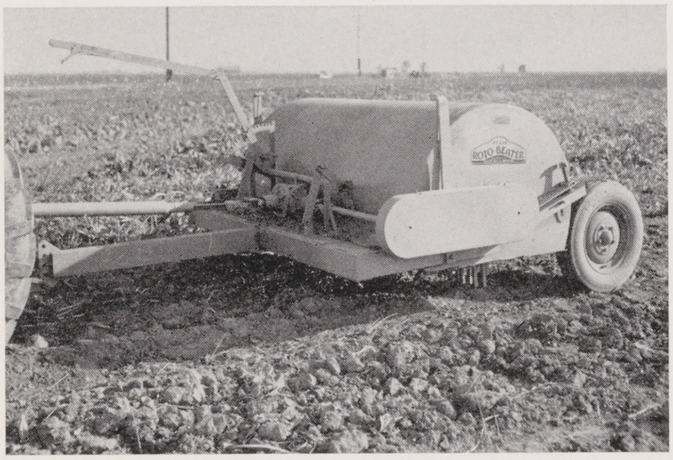
6

The windrowing attachment in use. Accurate truck driving leaves the windrows almost untouched.



7

The Spreckels-designed rear coulter mount expedites Marbeet operation in trashy fields.



8

The Olson Roto-Beater, with flails beating the furrows only, makes machine harvesting easy in trashy fields, while still conserving tops for feed.

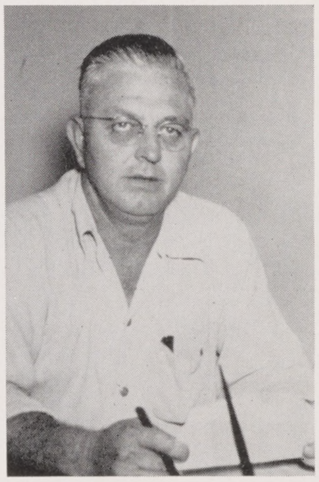
9

This Lembke beater is disintegrating water grass which would otherwise make mechanical harvest impossible

LAND LEVELING FOR MAXIMUM SUGAR BEET PRODUCTION

By R. T. MARVIN

Manager, Marvin Landplane Co.



10

It is generally conceded that proper irrigation is one of the most important factors in sugar beet raising. Proper irrigation cannot be administered on uneven land. Therefore, land leveling is a most important step in preparing ground for sugar beets. Smooth, level ground is one answer to the elimination of soil decline in irrigated areas.

Level land is necessary to prevent leaching of plant nutrients caused by deep percolation of water over low spots. Overpercolation or flooding takes place when it is necessary to raise the water level high enough to force it over uneven high spots. Soil may lose its productivity due to sealing of the soil structure caused by waterlogging. This difficulty can be kept to a minimum on level land with the proper use of water.

Level land is also vitally important to get the best results from fertilizer. If water is allowed to stand in low spots for long periods, it has a tendency to carry plant nutrients and fertilizer below the root structure, with little or no value to the plants. On high spots where sufficient water is lacking to moisten the ground around the plant feeder roots, a good portion of fertilizer becomes ineffective due to lack of moisture to dissolve plant nutrients.

The importance of proper and even distribution of moisture in sugar beet raising cannot be overestimated. Moisture evenly distributed is essential to the propagation of soil bacteria, which makes nutrients available for the growth of the sugar beet. Level ground with a well-mulched top soil and irrigation at sufficiently regular intervals are important requisites in successful sugar beet raising.

Quite apart from the basic advantages of level land is the well-pulverized soil surface remaining after the land leveling operation. This operation usually leaves the surface in excellent condition, either for subsequent flat planting or listing into ridges. Thus, when land leveling becomes a part of the soil-maintenance program, floating, as a separate clod breaking operation, becomes unnecessary.

Land leveling is accomplished either by "Carryall" or "Landplane." "Carryall" leveling is indicated where one foot of soil or more is to be removed from humps extending 100 feet of more in either direction. The cheapest way to complete the leveling and smoothing of the land after the "Carryall" has leveled to a "rough in" condition is to Landplane in two directions for the final operation. Landplaning costs run as low as fifty cents per acre for fuel, labor and lubricants. On tracts where 10 inches or less of soil is to be filled, or removed from high spots, the oper-

(Continued on page 6)

LEVELING

(Continued from page 5)

ation can be done more quickly and cheaply with three or four Landplanings.

The result of Landplaning is a permanent investment in the land, with good seedbed preparation, low irrigation costs, and a uniform maturity of sugar beets.

11

The Landplane on a rough field compares to a carpenter's plane on a rough board.

MORE MONEY FOR YOUR BEETS

By RONALD HAYES

Merchandising Manager, Spreckels Sugar Company

As you know, when sugar is sold in areas where it is produced it means a saving in freight and, therefore, greater returns for sugar beets. You can help us increase local distribution of Spreckels Honey-Dew Sugar and put additional dollars in your pocket.

Here is a five-point promotional procedure:

1. Tell the proprietor of your grocery store how important it is always to stock Spreckels Honey-Dew Sugar.
2. Tell your friends to tell their grocery store proprietors to stock Spreckels.
3. Tell the industrial users of sugar in your community always to use Spreckels. Industrial users include bakers, canners, bottlers, ice cream manufacturers, syrup manufacturers, candy makers, etc., etc.
4. Tell the hotel and restaurant owners that when they buy Spreckels Honey-Dew they help increase the prosperity of their community. They will quickly get the picture.
5. Tell your friends to tell their friends always to insist on Spreckels Honey-Dew when they buy sugar.

Hundreds of growers produce sugar beets for the Spreckels Sugar Company each year in California. If every grower consistently followed the above plan, the local distribution of Spreckels Honey-Dew Sugar would increase tremendously and this would mean—MORE MONEY FOR YOUR BEETS.

INDUSTRIAL UTILIZATION

(Continued from page 3)

Of course, the best-known of all sugar byproducts is molasses. Molasses is about one-half sugar but contains many other materials which make removal of additional sugar difficult. Cane molasses and beet molasses both contain sugar but differ in that a good deal of the sugar in cane molasses is inverted to dextrose (D-glucose) and levulose (D-fructose), whereas most of the sugar in beet molasses is sucrose. Both types of molasses may be looked upon as low cost forms of sugar. The greatest uses in the past have been for stock feeding and various fermentations. We will confine our remarks to a few of the more recent developments.

MOLASSES IMPROVES SILAGE

The preparation of silage from green corn is a very well-known art. We know that cornstalks contain a considerable amount of sugar. This is ordinary sugar, such as found in sugar cane, which is a botanical relative of corn. In the silo, a bacterial fermentation of the sugar to lactic acid occurs, and certain vitamins, notably C, are formed which add to the nutritive value of silage for winter feeding. Other plants, such as grass, are less suitable for making silage because they do not contain enough sugar to support a vigorous fermentation or to produce enough lactic acid to preserve the silage. The addition of molasses will correct this condition and produce excellent silage from hay. Such silage is increasingly in use in the areas where corn is not a major crop. Moreover, in case of wet weather at haying time, wet hay can be salvaged as silage. The potential outlet for molasses for such purposes is tremendous. However, the popularity of molasses would be much increased if it could be transported and handled in solid form. Of course, molasses can be dried, but its affinity for moisture is so great that it becomes wet again rapidly on exposure. It remains to be seen whether this problem can be solved, but it is at least being given attention by this Foundation.

At the moment, molasses is commanding a high price because of the unprecedented demand for alcohol in the manufacture of synthetic rubber. This can hardly be expected to continue at the present level because of the rehabilitation of rubber plantations and the competition of butadiene from petroleum. Therefore, new outlets will undoubtedly be of interest.

USES FOR ALCOHOL

We are frequently asked whether alcohol has a potential outlet as motor fuel. This is a complicated question containing many factors difficult to estimate. There is one recent development worthy of mention in this connection. During the war considerable experiments were carried out with injection of water-alcohol mixtures into aircraft engines. The mixture is forcibly injected into the cylinder following the ignition spark when the flame has traveled about two-thirds of the way across the combustion chamber. The effect of the injection is to prevent a detonation and prolong the period of smooth, even pressure against the moving cylinder. The general result is an increase of power and pick-up. An automatic injection device has

(Continued on page 8)

The 1947 Honor Roll

A record list—according to available data, never before have so many growers for one beet sugar processor grown crops yielding over 25 tons of beets per acre.

Grower	Tons Beets Per Acre	Pounds Sugar Per Acre
P. M. Resetar Co.	39.60	13,639
Mary F. and E. E. Nutting	39.14	11,946
F. D. Willoughby & Son	38.33	12,027
Peter and Arnold Breschini	37.11	12,163
Silva Bros.	36.37	11,994
Sears Bros. & Co.	36.10	10,562
Sears Bros. & Co.	35.74	11,209
Henry Teraji	35.62	11,371
Vojvoda Bros.	35.58	10,711
John Rasmussen	35.23	11,119
Chester M. Locke	35.19	10,128
M. Furtado & Son	35.10	12,216
Joe Jacinto	35.00	10,712
A. D. Fagundes	34.87	10,489
Gibson Bros.	34.28	11,821
John S. and Leo Tamagni	34.24	12,211
A. Poloni	33.98	11,702
Con Ferrasci	33.94	11,643
F. J. Saveria Co.	33.64	10,886
Thos. B. Porter	33.59	11,213
J. H. Hayes	33.37	10,959
Paul B. Tavernetti	33.27	12,323
Elmer Gomes	33.09	11,727
Coit Ranch, Inc.	33.02	9,398
R. A. Renz	32.99	11,744
Matteucci Bros.	32.99	11,308
David F. Willoughby	32.92	11,833
Peter J. Sanchez	32.69	9,323
Frank Cotta	32.34	9,981
Gabilan Packing Co.	32.10	10,785
John and Bob Corda, Jr.	32.02	10,453
Petersen Bros.	31.98	10,984
Louis P. Battinich	31.90	10,285
Chester M. Locke	31.80	9,737
John R. Breen	31.67	10,495
D. F. Gomes	31.64	10,576
Farley Fruit Co.	31.64	10,415
Irvin Dethlefsen	31.53	8,941
Irvin Dethlefsen	31.50	9,122
Elmer Gomes	31.47	10,498
Thomas G. Eckart	31.44	9,432
Anthony J. Garcia	31.36	11,477
Jack and Hubert Brown	31.36	9,063
M. L. Kalich Co.	31.29	9,499
Antonio Luiz	31.20	8,936
Robert Harlan	30.99	8,838
Gibson Bros.	30.91	10,758
E. I. O'Connell	30.85	8,970
Hitchcock Bros.	30.83	11,011
Luis Scattini	30.57	10,747
Gordon G. Guiberson	30.39	9,846
J. H. Maurer	30.34	8,962
R. J. Thorne	30.31	9,450
Ben Bauer	30.30	10,716
Norman S. Frank	30.30	9,526
Hitchcock Bros.	30.16	10,334
L. Verzasconi	29.96	9,307
Elmer Dethlefsen	29.88	10,906
Harry R. Semas	29.88	10,029
C. H. and Maria Ferrasci	29.86	9,293
Harry Rianda	29.77	8,388
R. E. Meyers Co.	29.76	9,625
Tavernetti Ranch	29.76	10,487
Irvin Dethlefsen	29.67	9,862
Matteucci Bros.	29.65	8,859
M. G. DaRosa	29.57	9,657
W. B. Grainger Pkg. Co.	29.54	9,168
K. R. Nutting	29.51	8,865
V. C. Britton & Co.	29.40	9,196
Thos. B. Porter	29.29	10,042
D. M. Doyle	29.29	8,266
Botelho Bros.	29.26	9,995
Robt. Sprugasci	29.23	8,851
Pasque & Franscioni	29.15	8,505
R. V. Tidd	29.13	11,057
Paul Anthony	29.08	9,875
Salinas Valley Vegt. Exch.	29.04	9,577
Peterson Bros.	29.02	10,082
J. H. Lavagnino	28.94	9,459
Elmer Dethlefsen	28.88	9,502
Otto Strehle	28.87	10,214
Nunes & Coelho	28.84	9,095
Carlo Massolo, Jr.	28.82	8,652
Gene Kane & Co.	28.79	8,926
T. E. and K. W. Hatcher	28.76	10,244
J. J. King	28.66	10,139
Peter Fanucchi	28.57	9,525
Sam and D. M. Biancucci	28.54	9,835
Breschini Bros.	28.45	9,018
Mary F. and E. E. Nutting	28.39	8,450
Louis P. Battinich	28.36	9,369
George Fiscalini	28.20	9,504
Ferry Morse Seed Co.	28.18	9,952
Tom Hudson, Jr.	28.04	9,566
A. Madolora	28.04	8,094
Earl Wilson Pkg. Co.	28.02	8,775
James P. Dolan	27.91	10,013
W. M. Christensen	27.89	10,526
Tom Storm	27.89	10,514
Jensen Bros.	27.86	9,622
Tony F. Garcia	27.85	9,340
Arcotti Bros.	27.82	9,694
Meek and Le Maitre	27.77	8,853
Mary F. and E. E. Nutting	27.75	8,821
A. Frew	27.72	8,953
Frank Rossi	27.60	9,201
Violini Bros.	27.59	9,106
Matteucci Bros.	27.55	8,740
Toney Mendonca	27.54	9,858
Allen Moore	27.51	10,058
J. H. Hayes	27.50	9,184
Pauline Capitanich	27.45	8,262
A. and V. Vosti	27.44	8,320
John E. Jackson	27.22	8,297
E. M. Juhler	27.19	9,730
England & Rafferty	27.10	7,902
N. L. and Karl J. Koue	27.06	8,195
Dan G. Best	27.05	9,072
Harry Rianda	27.02	8,326
George Jacinto	26.99	9,890
Hass & Ullrich	26.98	8,272
J. P. Jarvis	26.95	9,747
O. O. Eaton	26.87	8,457
Joseph B. Silva	26.87	8,635
A. Madolora	26.86	8,363
Adolph Hansen	26.80	9,009
Joe Minhoto	26.76	9,667
Henery Damsen	26.72	8,614
Carlo Massolo, Jr.	26.72	7,343
Bruce Church & Jas. Hughes	26.68	8,958
Coit Ranch, Inc.	26.68	7,166
W. B. Grainger Pkg. Co.	26.66	7,511
Ella O. and Chas. S. Gubser	26.63	8,725
Tony F. Garcia	26.53	9,111
Anthony J. Garcia	26.47	9,332
R. V. Tidd	26.45	9,262
Aiman Sutliff	26.43	9,414
Wm. D. Crinklaw	26.36	7,656
Joe Cunha	26.35	9,000
A. C. Petersen	26.25	8,808
Tony and Tom Sanchez	26.22	9,173
Otto Burgdorff	26.18	7,294
Marcel Tash	26.09	6,476
S. Morita	26.02	9,029
Andrew Tarp	26.02	7,729
T. R. Smith & T. E. Usrey	26.00	9,211
Harry R. Semas	25.98	8,896
Lindeleaf Bros.	25.95	8,282
Martella Bros.	25.94	8,094
Bennie S. Black	25.85	9,025
Pete Pedrazzi	25.84	8,234
O. O. Eaton	25.82	8,577
John Botelho	25.76	9,305
J. F. Fulmor	25.75	8,982
A. H. Christensen, Jr.	25.73	9,175
Silva Bros.	25.72	9,500
Joe Tschumperlin	25.72	9,317
A. Acosta	25.71	9,014
T. W. Chung	25.71	7,717
Bruce Church Co.	25.66	8,452
Tony and Tom Sanchez	25.62	9,219
A. Gubser & Son	25.61	8,195
Joe B. Guidotti	25.60	8,785
Pasque & Franscioni	25.58	7,408
Joe Montano	25.57	9,761
A. D. Villarba & G. Sulamo	25.55	8,149
R. G. Wood	25.52	8,274
Harlan & Dumars	25.49	8,748
John G. Nunes, Jr.	25.44	8,522
R. A. Renz	25.43	7,730
Gene Kane & Co.	25.38	8,762
Manuel Dutra	25.35	9,481
M. Carden	25.32	9,070
T. E. and K. W. Hatcher	25.23	9,123
Richard Moore	25.23	8,755
F. S. Travers	25.21	8,899
W. T. Bramers	25.19	9,043
Harold and Lloyd Gilbert	25.16	8,021
E. A. Carden	25.09	9,183
H. Allemand	25.06	8,612
Alvin Noll	25.03	8,646
S. A. Gerrard Co.	25.01	6,563

INDUSTRIAL UTILIZATION

(Continued from page 6)

now been designed for automobiles. It is intended to function automatically when the engine is subjected to a strain on a grade or on acceleration. It should make possible the use of lower octane gasolines for driving on a level or at even speed. The vehicle is equipped with an auxiliary fuel tank containing a 50:50 alcohol water mixture. This tank has about one-tenth the capacity of the main fuel tank.

If such injection devices should come into general use, they could conceivably produce a demand for millions of gallons of alcohol for fuel purposes.

The other uses of alcohol are so well known that we shall not detail them here. Moreover, the dramatic story of the bacterial fermentation of molasses to acetone and butanol is now so well known that we cannot give it our attention despite the fact that this story gives one of the best illustrations of the possibilities that exist for establishment of new industries based upon the chemical action of micro-organisms.

In considering the utilization of molasses, the chemist does not depend altogether upon yeasts, molds and bacteria to do his work for him. Two of our most important Foundation projects are devoted to finding out more fully what is in molasses besides sugar. If the nonsugar constituents can be identified, molasses may be utilized more intelligently. Foundation chemists have also shown that sucrose octaacetate and other chemical derivatives of sugars can be obtained directly out of molasses in a pure, crystalline condition, so that molasses can serve as a low cost source of sugar derivatives.

MONO SODIUM GLUTAMATE — A SUGAR BYPRODUCT

Under present operating conditions hardly any part of the sugar beet is wasted. The tops are used for cattle feed, as is the pulp from which sugar has been removed and much of the molasses. One of the outstanding byproducts is mono sodium glutamate, which is now recovered on a large scale from the liquors remaining after most of the sugar has been taken out. Mono sodium glutamate is one of the constituents of oriental soybean sauces. It was originally valued mainly for its flavor and used as a condiment to increase the appeal of many food products. More recently some remarkably new values have been discovered. Daily doses of glutamic acid have been found to control the type of epileptic seizure called petitmal by the physicians. In rats the feeding of glutamic acid has been reported to increase the ability to learn and to speed up the learning process.

FURTHER POSSIBILITIES

Despite the fact that very little beet pulp now goes to waste, possibilities for new developments exist. The pulp contains a large proportion of pectin quite similar to the pectin of fruits. The Germans are said to have made pectins capable of producing jelly from fresh beet slices. It is probable that this pectin undergoes some modifications during treatment in the milling and drying of the pulp. However, in addition to the demands of the food industry for pectins of high jellying power, there is considerable need for edible agents that are capable of forming very viscous solutions. Such thickening agents find an outlet in ice cream, chocolate milk, puddings, sizings, icings, pharmaceuticals, cosmetics, printing inks and dyeing processes.

The chemical breakdown of beet pectin produces arabinose and galacturonic acid. Salts of the latter are sometimes prescribed along with the sulfa drugs to aid in their elimination. Arabinose has been said to retard the staling of bread. Nevertheless, the potentialities of these substances are little explored. Other byproducts of the sugar beet are raffinose and betaine. The latter may possibly have some share in the nutritive values of beet pulp for cattle.

As recently as twenty-three years ago, the United States was a heavy importer of citric acid, the characteristic acid of lemons. This acid is widely used in foods, soft drinks, medicines, confectionery and the like. During the war a great deal was used in processing blood plasma. As we increased our production of this acid from cull citrus fruits, the imports declined after 1922. In 1923, production of the acid by mold fermentation of molasses began. By 1929, this production amounted to 7,000,000 lbs. At present we make about 26,000,000 lbs. by all processes, the mold fermentation being now the largest. Beet molasses is the main raw material, with varying amounts of cane molasses blended in.

A great many strains of mold have been found to convert sugar into various new chemical products. It is to be expected that some of these will eventually prove to be valuable, and the Sugar Research Foundation expects to give increasing attention to these possibilities.

Perhaps the most profitable demonstration in the Foundation's first four years has been the harmony and enthusiasm displayed by different sections of the sugar industry working for common purposes in this international organization. This spirit, aided by continuing research, promises to go far toward stabilizing and expanding the market for this great agricultural crop, and making sugar a more useful servant of mankind.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

Editor
AUSTIN ARMER
600 California Fruit Bldg.
Sacramento, Calif.

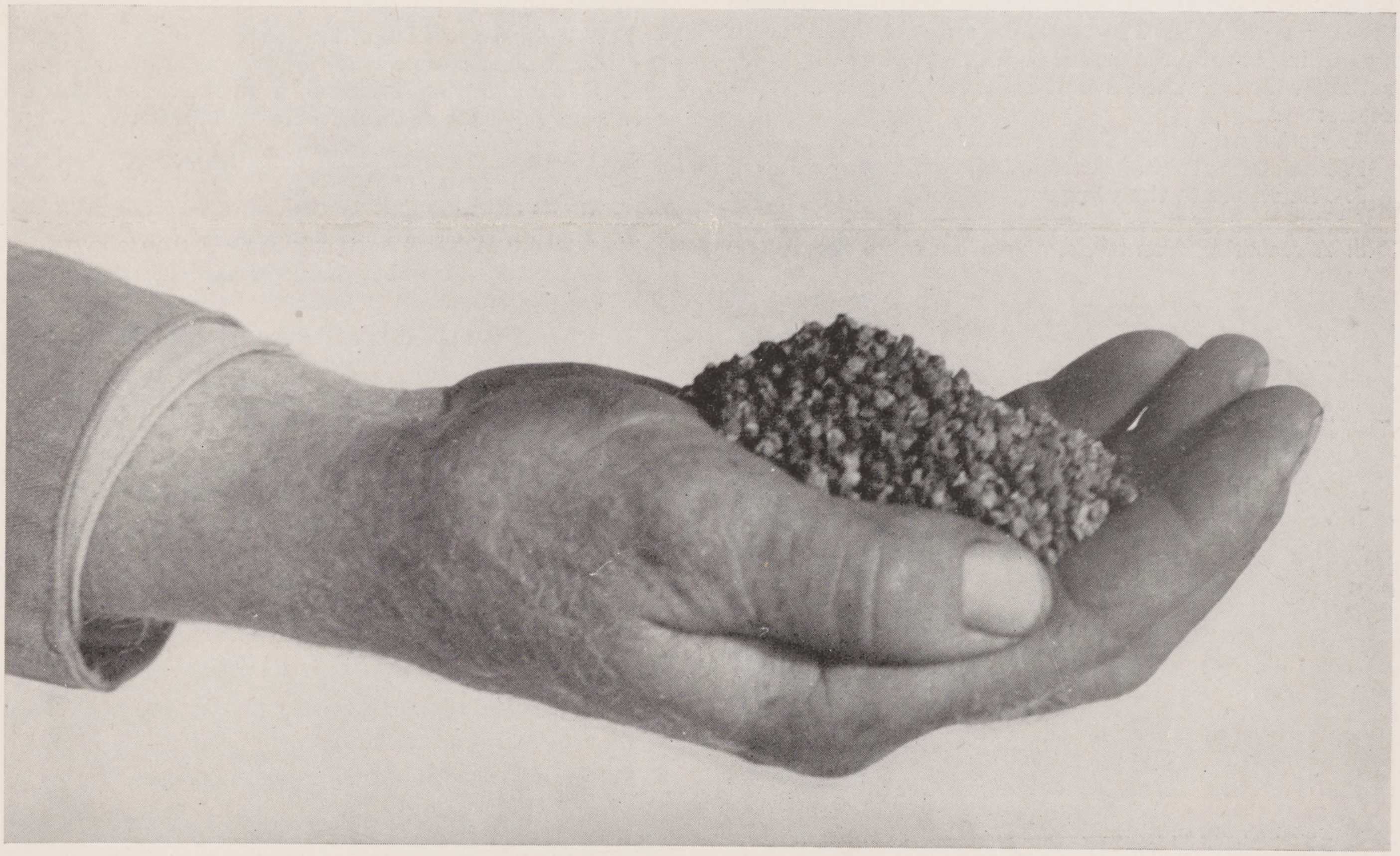
Associate Editor
NAIDA BECKETT
2 Pine Street
San Francisco, Calif.

SALINAS PUBLIC LIBRARY

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XII MARCH-APRIL 1948 No. 2



1

ONE TON OF SUGAR BEETS

can be harvested from this handful of processed seed as issued to Spreckels growers for the 1948 season. This new processed seed offers:

"BUILT-IN" RESISTANCE TO DAMPING-OFF ORGANISMS

A MAXIMUM NUMBER OF SINGLE PLANTS

RAPID FIELD GERMINATION

This issue tells the story behind the new seed development.

HONEY-DEW

THE SPRECKELS SUGAR BEET BREEDING PROGRAM

By W. B. MARCUM

In Charge Plant Breeding, Spreckels Sugar Company

A sugar beet breeding program was started by the Spreckels Sugar Company in 1945 for the purpose of developing varieties which would be more adaptable to higher sugar production in the areas in which our growers produce sugar beets. The broad objective of the program was to improve varieties, through selection and hybridization, which would have the following specific characters:

1. Resistance to the factors causing bolting.
2. Resistance to the organisms causing downy mildew.
3. Resistance to the virus causing curly top.
4. Increased yield of roots and per cent sucrose.
5. A recombination of the above desirable characters.

2

The author taking notes on a mother beet selection which is starting to bolt.

The general method utilized to study varietal improvement was by means of controlled pollination studies of a large number of selected individuals. Seed from these strains were tested under severe conditions of disease and bolting. A reselection of roots was then made from the most outstanding strains and after refrigerating for 60 days to induce bolting, these roots were transplanted for subsequent controlled pollination work. In addition, roots from the best of the outstanding lines were planted in isolated plots, far enough from the beet growing areas to prevent crossing with early bolters in commercial fields, for the formation of new varieties.

After three years, over 3,500 strains have been developed and tested in this manner. This work has progressed to such an extent that conclusive results have been obtained indicating considerable progress.

RESULTS OF PLANT BREEDING WORK

We feel that many of the aforementioned objectives have very nearly been attained and our sugar beet growers may soon be able to capitalize on them through use of new and better varieties. Although much testing work

(Continued on page 16)

STEPS IN THE PRODUCTION OF PROCESSED SUGAR BEET SEED

By R. S. LAMBDIN *and* WALTER H. BUCKINGHAM

Spreckels Sugar Company

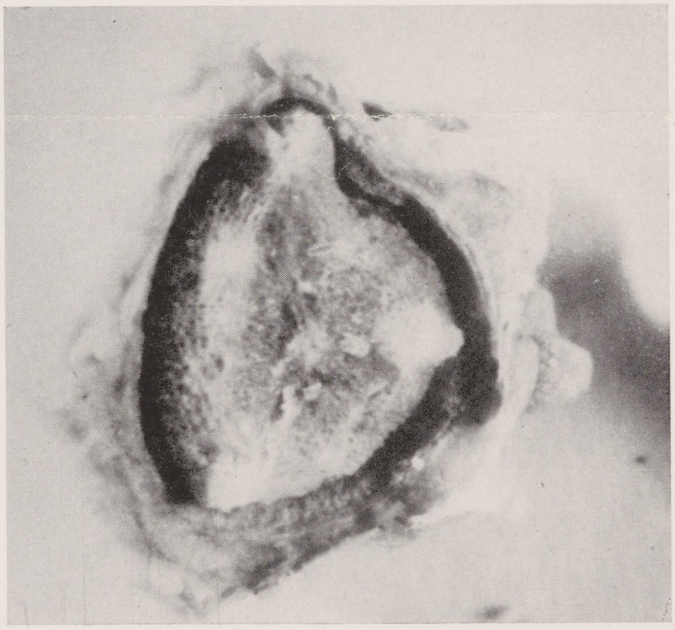
Ever mindful of the growers' need for the best possible qualities in sugar beet seed, Spreckels Sugar Company is now issuing decorticated and treated beet seed closely approaching an ideal product.

The equipment and methods for processing whole seed to attain these desirable qualities were selected only after clearly outlining the definition of an ideal seed. Such a seed must have the characteristics listed here:

1. A high field germination percentage.
2. Rapid field germination.
3. "Built-in" resistance to damping-off organisms.
4. A maximum number of single plants from all seed units planted.
5. A minimum number of deformed plants due to seed injury.
6. Uniform, rounded, and dust-free seed units for smooth planter operation.

To process whole seed in such a way as to attain these characteristics, the following steps were decided upon:

1. Lightly segment the seed to break down multiple seed balls.
2. Remove the outer, corky layer from each seed (decortication).
3. Screen the seed to obtain uniformity of size.
4. Aspirate to remove irregular shapes and light seeds of doubtful germination.
5. Spray each seed with a proved fungicide.



3

A beet seed before decorticating. The cortex forms a highly irregular, corky husk on the seed. (Enlarged 15 times.)

Step 5 provided the "built-in" resistance to damping-off organisms, and is described in a separate article.

Steps 1, 3 and 4 were accomplished with equipment already in use at the Company's Woodland and Spreckels seed stations.

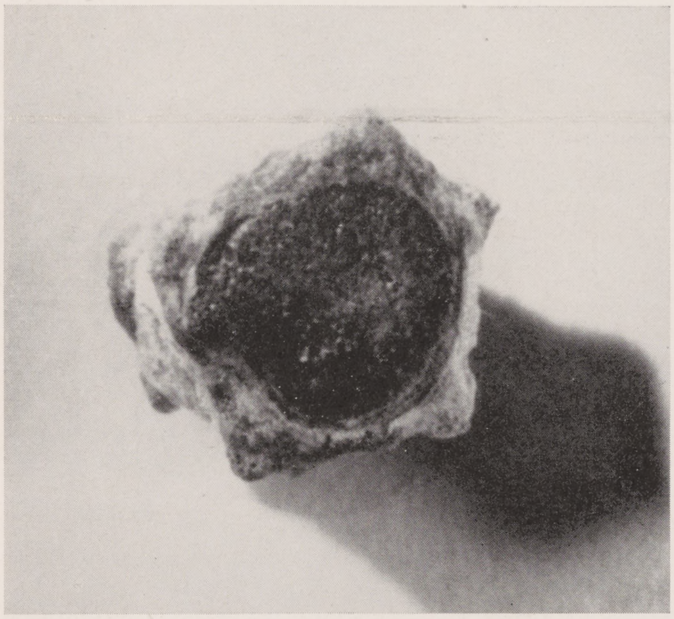
Step 2—*decortication*—required some study and the selection of an appropriate machine to do the job. Various manufacturers of seed processing equipment were contacted and samples of whole seed were sent for processing. After all the results of the products obtained from each of the manufacturers' machines were analyzed, it was decided that the Forsberg seed huller would most closely meet the requirements.

The Forsberg seed huller consists of a rubber covered tapered cylinder rotating in a rubber lined tapered chamber and is mounted on a frame with an aspirator and blower.

Decortication is accomplished by the action of the cylinder rubbing against the outer liners. Clearances between the cylinder and liners range from no clearance to three quarters of an inch. Proper clearance is accomplished by a screw adjustment on the outer chamber.

The whole seed is first reduced by the shearing machine, using a steel wheel with the shear bar set between .110 inch and .164 inch, depending upon the size of the individual seed lot being processed. From the shearing machine the seed passes into the Forsberg seed huller, then to the cleaner, size-graded, and finally to air classification.

The resultant product is much more uniform in size and shape as compared with the previous year's product and excellent results have been secured from the use of this seed in precision planters.



4

A beet seed after decorticating. All corky material has been removed, leaving the seed surface smooth and hard. (Enlarged 15 times.)

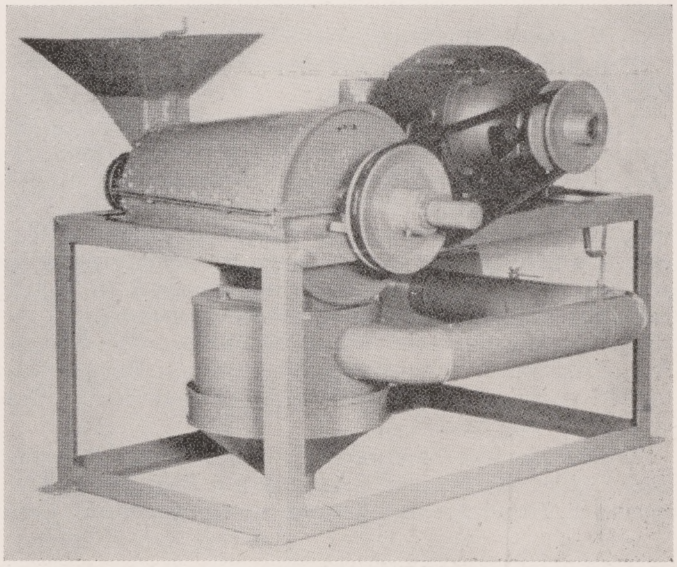
SPRECKELS WILL TREAT ALL SEED ISSUED TO GROWERS

By AUSTIN ARMER

Agricultural Engineer, Spreckels Sugar Company

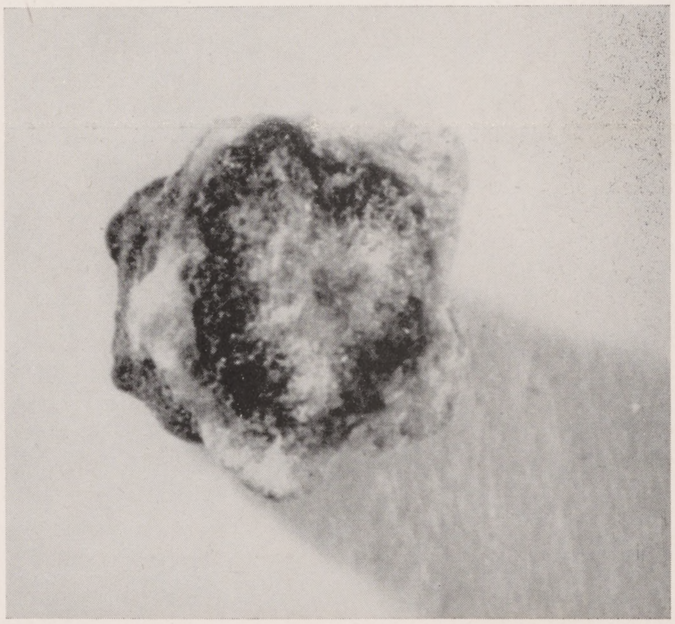
The treating of sugar beet seed with fungicides for protection against damping-off has heretofore been the unpleasant duty of the grower at planting time. Unpleasant, because fungicidal dusts are highly irritating, causing inflammation to both skin and mucous membranes.

(Continued on page 12)



5

The Forsberg seed huller.



6

A decorticated beet seed after receiving the sprayed fungicide treatment. The "frosty" appearance is due to adhering fungicide. (Enlarged 15 times.)

SEED TREATMENT *(Continued from page 3)*

The annoyance caused by the use of these irritating treating dusts has at last been eliminated. All seed issued by the Spreckels Sugar Company is now treated before bagging.

The method of treating was developed by the Agricultural Engineering Department, and it marks an important forward step in bringing to growers the fruits of recent research. The method of applying the treating material was worked out in cooperation with the Plant Pathology and Agricultural Engineering divisions of the University of California at Davis. Exhaustive tests on the experimental product were made before it was decided to build treating equipment on a commercial scale. The results of these tests showed that the new pretreating process offers:

1. A uniform dosage of fungicide to each seed.
2. Protection against damping-off equal to or better than that obtained by dusting.

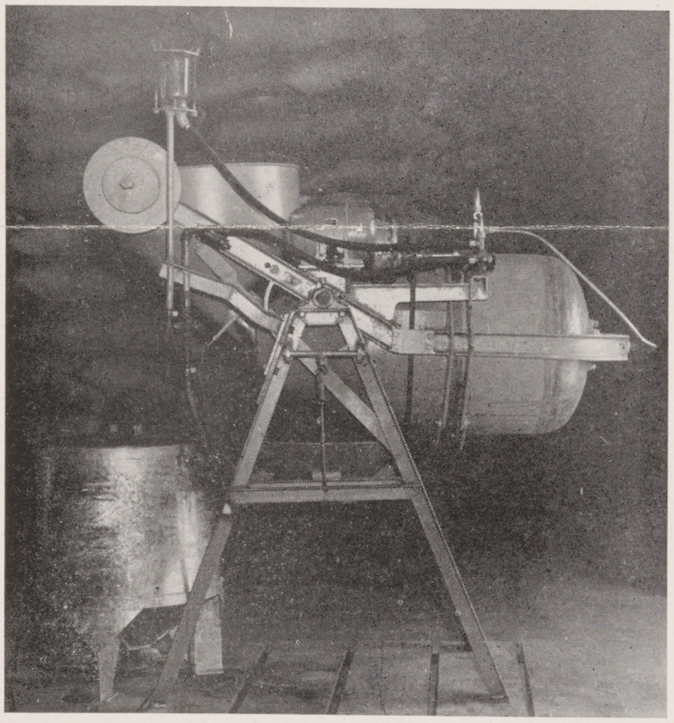
The development of a commercial applicator required considerable planning and ingenuity. Investigation revealed that continuous methods of seed coating were not capable of producing uniform coating on each seed. It was, therefore, necessary to devise a batch system whereby fifty pounds of seed were thoroughly agitated and mixed, while the fungicide was sprayed on in the form of a suspension in water, combined with agents for sticking, wetting and stabilizing the mixture. The Naugatuck Chemical Company, manufacturers of Phygon, extended valuable cooperation in the formulation of this sprayable fungicide.

The mechanism for automatically treating the seed was designed by the Spreckels Agricultural Engineering Department. Duplicate installations are in operation at the company's seed warehouses located at Spreckels and Woodland.

While involving no radical principles, these treating machines had to be designed from the ground up, for no existing mechanism had any potentialities for adaptation. The overall design was based on these specifications:

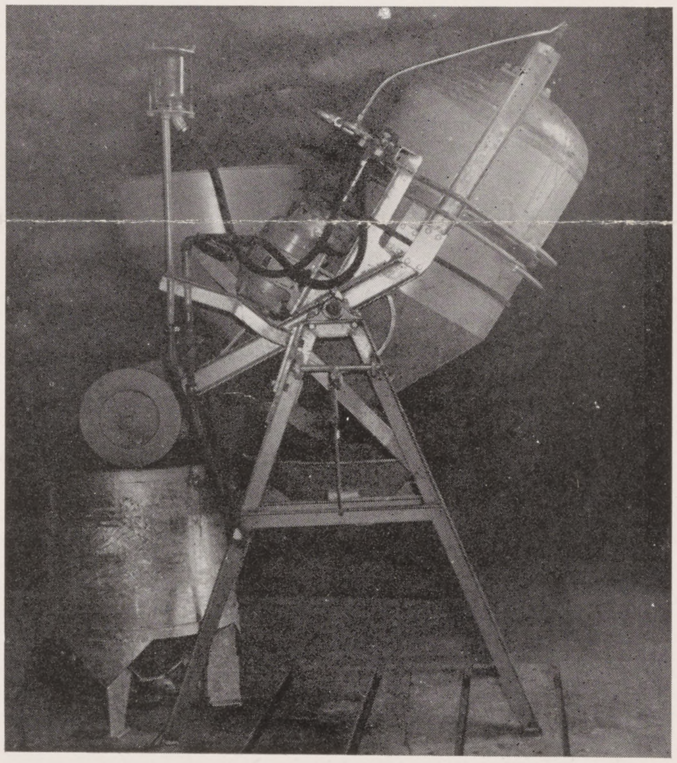
1. A cylindrical, inside-vaned drum rotating on a horizontal axis.
2. Spray nozzles within the drum, fixed in space and located so as to spray the falling sheets of seed with fungicide liquid.
3. Means for metering the volume of spray material automatically released during each refilling of the drum with seed.
4. Means for forcibly discharging the spray material through the nozzles.
5. Means for storing and agitating a supply of fungicide suspension.
6. Means for storing and releasing a charge of seed into the drum.
7. Means for discharging the contents of the drum into a bag.
8. A general arrangement of components permitting the receiving of seed at a minimum height and discharging at a maximum height.

We of the Spreckels Sugar Company believe that the introduction of pretreated seed is not only splendid evidence of cooperation between processor, experiment station and the chemical industry, but more important, it offers to Spreckels growers a seed supply having the greatest practical protection against damping-off, and completely eliminates the annoying and hazardous task of dust treating seed before planting.



7

The treating drum, now rotating on a horizontal axis, thoroughly agitates the seed, presenting each seed to a measured quantity of spray within the drum.



8

After spray treating, the seed is discharged by tilting the drum.

PLANTER SETTINGS AND RECOMMENDATIONS FOR PROCESSED SEED

By WALTER H. BUCKINGHAM *and* JOHN M. KENDRICK
Field Superintendents, Spreckels Sugar Company

Much has been written regarding the settings and operation of the various types of planters used in the planting of sugar beets. Regardless of this fact, there still remain many questions in the minds of individuals who must work with planting equipment.

Heretofore when planting sugar beets, seeding rates have been thought of in terms of "pounds per acre." While this term was applicable to plantings of whole seed with non-precision drills, it no longer applies. We must now think in terms of "seeds per foot."

Whole sugar beet seed contains from 28,000 to 30,000 seed balls per pound. A pound of processed seed contains from 38,000 to 46,000 seed-balls. Consequently, if the same seeding rate is used for processed seed as for whole seed (in terms of pounds per acre), much more seed is distributed over any given foot. Since our primary concern is with the number of seeds laid down every foot of row, it becomes more expedient to refer to our seeding rate in terms of "seeds per foot." If it is desired to convert seeds per foot to pounds per acre, it can be easily accomplished by multiplying "seeds per foot" by a factor, .625. Thus if the rate is 8 seeds per foot, approximately five pounds per acre will be planted.

The following information, while not adaptable to all areas, may be used as a guide for those operating the various planters.

GENERAL OBSERVATIONS

Even with the so-called precision planters, the success of planting depends upon strict adherence to recommended planter speed. Speeds in excess of those considered allowable reduce the cell fill and, consequently, reduce the seeding rate and cause erratic spacing. *Growers who plant at excessive speeds can expect irregular stands with many skips.*

On all horizontal plate drills, using round hole cells, it is recommended that the holes be enlarged to at least 11/64th inch and possibly to 12/64ths inch for optimum cell fill.

It is of major importance with the present processed seed that the seed be kept dry and that seed cans and hoppers be maintained in a clean, dry condition. Failure to observe these precautions will hamper operations and may result in faulty planting and poor seedling stand.

PLANET JUNIOR

Extensive use of Planet Junior units with the present seed, graded 7-10/64ths, has indicated that the #19 or #20 hole will plant 8 to 11 seeds per foot at a speed of 3 miles per hour. While the importance of planting speed has been stressed already for the precision planters, it must be further stressed for the non-precision Planet Junior. In this case the seeding rate is progressively reduced as speeds increase over the allowable maximum of 3 miles per hour.

MILTON PLANTER

The Milton planter is equipped with a 139 cell ring which plants between 7 to 9 seeds per foot. Although this planter is advertised as a high speed drill, speeds should be held down under 3 miles per hour in order to obtain the best performance.

Planter data compiled by Professor R. D. Barmington of Colorado A and M College after extensive tests correspond closely with trials conducted by Spreckels Sugar Company and are, therefore, included herein for guidance.

TABLE 1

(John Deere #18—#22—#55—with 72 cell plate and 9 tooth ground wheel sprocket)

Gear	Seeds Per Foot*	Maximum Allowable Planter Speed (M.P.H.)
12 Teeth	3.01	6.0
14 Teeth	3.52	5.0
16 Teeth	4.02	4.0
20 Teeth	5.02	3.5
24 Teeth	6.04	3.0
30 Teeth	7.55	2.0

***With 100 per cent cell fill.**

TABLE 2

(John Deere #64—#66—with 72 cell plate)

Gear Ratio	Seeds Per Foot*	Maximum Allowable Planter Speed (M.P.H.)
7/9	3.54	6.0
7/8	3.98	5.5
8/7	4.55	4.5
12/9	6.05	4.0
12/8	6.82	3.0
12/7	7.80	2.75
18/9	9.10	2.5
18/8	10.22	2.25
18/7	11.99	2.0

***With 100 per cent cell fill.**

TABLE 3

(International #40 with 82 cell plate)

Sprocket Ratio	Seeds Per Foot*	Maximum Allowable Planter Speed (M.P.H.)
8/16	1.78	8
8/14	2.04	8
8/12	2.38	8
8/10	2.87	7
8/8	3.59	6
17/16	3.82	5
17/14	4.37	4.5
8/6	4.78	4
17/12	5.08	3.5
17/10	6.06	3.0
17/8	7.62	2.5
17/6	10.10	2.25

***With 100 per cent cell fill.**

TABLE 4

(Cobbley Plantrol)

Gear	Seeds Per Foot*	Maximum Allowable Planter Speed (M.P.H.)
38 Teeth	4.04	5.5
24 Teeth	6.38	4.0
18 Teeth	8.50	2.75
14 Teeth	10.90	2.25

***With 100 per cent cell fill.**

THE AUTOMATIC POLARISCOPE— A SPRECKELS RESEARCH ACHIEVEMENT

By R. A. McGINNIS

Head Research Chemist, Spreckels Sugar Company

The scientific world was given its first view of an instrument which promises to solve some of the most troublesome inaccuracies involved in the determination of the amount of sugar in the beets, when W. O. Bernhardt, research engineer of the Spreckels Sugar Company, presented a paper and demonstrated "An Automatic Polariscope" before the Chemistry Section of the American Society of Sugar Beet Technologists at its fifth general meeting in San Francisco, January 13. On January 16 a demonstration of the apparatus was made before the California Sugar Beet Growers Association at a luncheon at the Palace Hotel. A patent has been applied for, in the names of W. O. Bernhardt, J. R. Earl, E. M. Hartmann, and R. A. McGinnis.

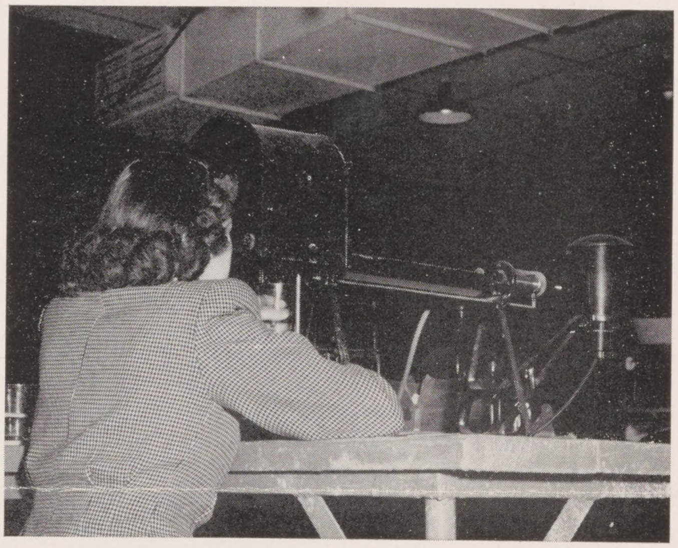
This remarkable instrument, which was designed to measure the polarization and thus the percentage of sugar in the Sachs-le-Docte filtrate obtained from each beet tare sample, not only adjusts and balances itself in a few seconds, but also prints its measurement directly on the tare ticket, and it is able to do this at the rate of 400 determinations per hour, far more accurately than was previously possible, without ever tiring. Since the grower's payments are based primarily on this measurement, the increased precision and accuracy obtained with the automatic polariscope are a source of great satisfaction to both beet grower and processor.

The normally used polariscope is the "half-shade" type, in which adjustment is made by balancing two visual fields. In order that this balance may be made with precision, it has been found that the light intensity of the fields must be kept very low. The eye of the operator is required constantly to readjust itself between the low intensity balancing field illumination and the higher intensity of the exterior illumination necessary to record the readings. This continual readaptation of the eyes results in rapid fatigue. Various methods are used to combat this. The Spreckels Company uses two skilled operators, who relieve each other in half-hour shifts. In spite of this, however, fatigue is still an important factor.

Another source of error in visual polarimetry is the so-called "personal error." There is frequently found, even among skilled operators, an unavoidable tendency to make small consistent errors in all readings, in a single direction.

The third serious error comes from the necessity of reading the measurement on a vernier scale, and recording it on the tare ticket. Since no humans are infallible, errors will occur from time to time and, once made, are impossible to detect.

Since the polariscope's measurements are of such importance, vigorous efforts have been made during the last thirty-five years by research workers all over the world to devise a means of eliminating the personal factor. Prominent among these may be noted the investigations of Stanek and Sandera in Czechoslovakia; of Coblentz and Emerson in the United States; of duPrel, von Halban and Seidentopf, Winkel, Spengler and Hirschmueller, Ebert and Kortuem, Mayrhofer, Schoenrock and Eins-

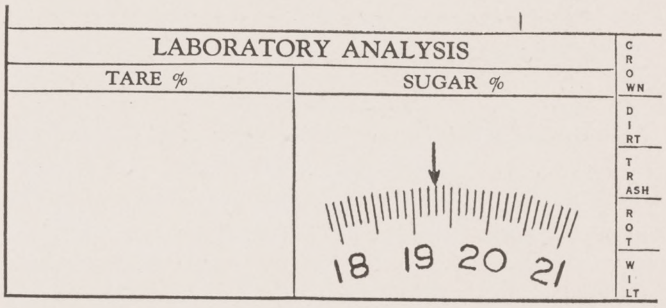


9

Visual type polariscope in operation. Eye fatigue taxes the best operator in making accurate determinations.

10

Three of the inventors of the Spreckels Automatic Polariscope are: R. A. McGinnis, Head Research Chemist; W. O. Bernhardt, Research Engineer, and E. M. Hartmann, Traveling Chemist.



LABORATORY ANALYSIS

TARE %	SUGAR %	
	18 19 20 21	CROWN DIRT TRASH ROT WILT

11

Facsimile of the automatically printed sugar percentage on a Spreckels analysis ticket. The impression on the envelope is clearly duplicated on the tickets sealed inside.

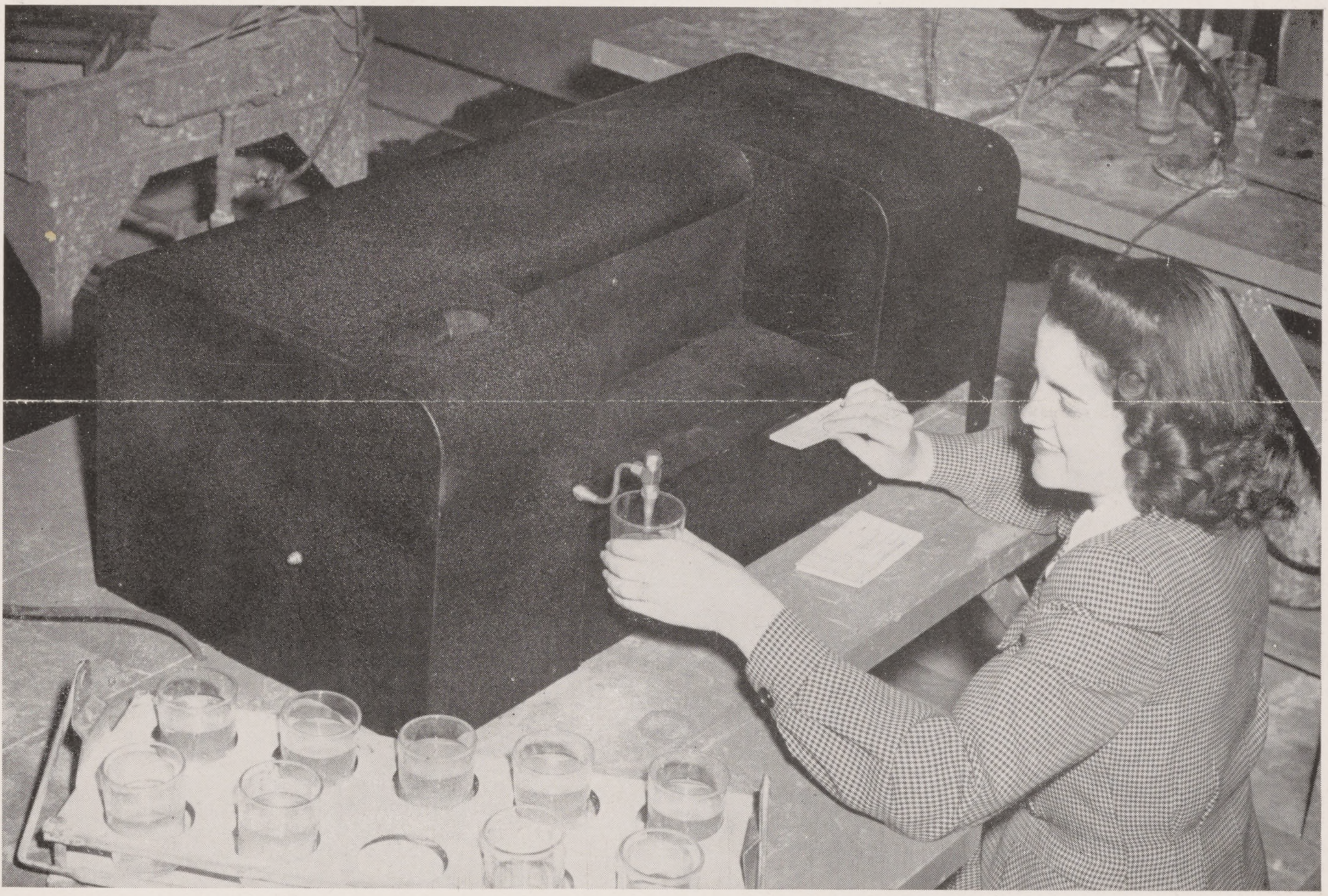
porn, and Landt and Hirschmueller of Germany; of Kenyon and Dickes of England; of Bruhat, Chatelain, Guinier, Desains and de La Provostaye of France; and of Singh and Rao of India. None of these investigators was able to solve this problem satisfactorily in spite of heavy expenditures of time and money.

Investigations were started by the Spreckels Company in 1941 by E. E. Morse and R. A. McGinnis, without great success. In 1944 J. R. Earl, a physicist then employed as a chemist at the Spreckels factory, resumed the work, aided materially by E. M. Hartmann, the chief chemist. The work was again interrupted and was not continued until the fall of 1946, when Earl was attached to the Woodland research department to complete the task. Here good progress was made. However, he left the Company's employ in April, 1947, and the project was finally brought to completion by W. O. Bernhardt of the research staff, assisted by Hartmann and McGinnis. Important help was also given by E. E. Morse and F. G. Eis of the research department, F. H. Ballou, Jr., of the engineering department, and J. J. Smith of the electrical department.

Following completion of the first model in October, 1947, the apparatus was subjected to the most rigorous tests by the research department. Passing these successfully, it was then carefully tested for several weeks by chief chemist S. Moore, in tare laboratory operation, where it read duplicate samples and special test samples in an extended break-down test. Again emerging successfully, the machine was subjected to a careful examination by Mr. D. K. Proffitt, technical representative of the sugar beet growers in the district. Having secured his unqualified approval, the automatic polariscope then took on the burden of making all the tare laboratory determinations for the balance of the season — a matter of some four weeks' time and over 35,000 determinations. During this whole period one sample of known sugar content was introduced with every ten tare samples, to make certain that any divergence from true determinations would be immediately detected. Through all this work the apparatus performed in a highly satisfactory manner.

While the operating principles of the automatic polariscope are essentially simple, their physical embodiment is complex, and explanation will not be attempted here, except to say that its construction would not have been possible without the use of the most modern scientific tools, such as the photocell, high gain amplifiers and phase sensitive motors. While complicated, the machine is quite stable. The apparatus can be built around any "half-shade" polariscope; in this case a Bausch and Lomb Lippich prism type was employed. While only one automatic polariscope exists at the moment, all Spreckels tare laboratories will be equipped before the next campaign.

(Continued on page 16)



12

The automatic Polariscope in operation. Sugar solution is drawn from the beaker, analyzed, and the sugar percentage stamped on the analysis ticket—all automatically and independent of human error.

AUTOMATIC POLARISCOPE

(Continued from page 15)

The most noteworthy feature of the apparatus is its accuracy, which is limited only by factors outside itself, such as the standard flow-through tube system. Depending upon the circumstances, and the scientific criterion employed, its accuracy is from two to ten times greater than the visual polarimeter, by direct comparison. In visual polarimetry, measurements are made in tenths of one per cent sugar, while with the automatic polariscope they are made in hundredths. For the interest of the scientifically inclined, a rigorous set of comparison tests gave a standard deviation of 0.04 for the automatic polariscope, and 0.18 for the visual polariscope.

The Spreckels Company is (it believes, justifiably) proud that it has solved this long-standing problem, where all others have failed, and believes that the increased accuracy of measurement of the sugar in the beet that this apparatus makes possible will benefit both sugar beet grower and processor.

———o———

BREEDING PROGRAM

(Continued from page 10)

remains to be done throughout our beet growing areas and sufficient supplies of seed must be obtained to plant extensive acreages, it is felt that the growers would like to have a report upon the results thus far attained.

The potentialities of the varieties thus far developed, but which remain to be tested for adaptation to particular districts, are as follows:

(1) Varieties adaptable to earlier planting than any existing commercial variety and which have high bolting resistance, increased downy mildew resistance, and higher vigor. These varieties may soon lead to the development of August or September plantings which would furnish a rotational advantage to growers as well as to enable the harvest season to be extended over a longer period.

(2) Varieties with high curly top resistance and moderate bolting resistance which have the possibility of being adaptable to earlier planting in areas which are subject to heavy influxes of beet leafhoppers.

(3) Varieties having higher bolting resistance, increased downy mildew resistance, higher vigor, and greater yielding ability than any of the commercial varieties being used.

A sufficient quantity of seed of these varieties will probably not be available to make any extensive plantings until the fall of 1949 or 1950. In the meantime a number of tests will be conducted throughout our beet growing areas so that adequate performance of the various varieties can be fully ascertained.

CONTINUANCE OF THE BREEDING WORK

Further studies are currently being conducted leading toward additional improvements in varieties. During the 1948 season a large number of strains will be tested for resistance to bolting, resistance to downy mildew and resistance to curly top and further selections will be made from the better lines for the development of inbred and hybrid strains. Also, pollination studies will be inaugurated using the selections made in 1947 which should lead to the production of a large number of new and better strains.

In this work a considerable amount of effort will be made to improve sugar percentage, seedling vigor and uniformity in root shape. It is well recognized that varieties yielding a higher sugar percentage without decreasing root yield would prove of utmost importance, and it is hoped that some advancement can be made in this respect. There is also considerable interest in increasing seedling vigor so that emergence of seedlings can be speeded up to attain better stands when unfavorable conditions of moisture and crust formation are apt to be factors. Uniformity and shape of root are becoming of increasing importance with the advent of machine harvest. Studies will be made during 1948 which may eventually lead to the development of varieties better adapted to machine harvest.

THE PLANT BREEDING FARM

Most of the plant breeding work is currently being conducted on the 100-acre Spreckels Plant Breeding Farm, located at Spreckels, California. This farm is fully equipped for all necessary farming operations and normally 25 acres of it are devoted to the various breeding plots consisting of bolting tests, downy mildew studies, curly top studies, various variety tests, and pollination plots. The remaining 75 acres are devoted to commercial crops for purposes of rotation.

Growers are invited to visit this farm at any time to view the work currently being conducted with new strains, as well as with many of the existing commercial varieties.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

Editor
AUSTIN ARMER
600 California Fruit Bldg.
Sacramento, Calif.

Associate Editor
NAIDA BECKETT
2 Pine Street
San Francisco, Calif.

SALINAS PUBLIC LIBRARY

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XII MAY-JUNE 1948 No. 3

APR 27

1

NOT THIS YEAR

will the snow-fed mountain streams of California provide abundant irrigation water and electric power. Farmers are giving serious thought to:

ECONOMIES IN WATER DISTRIBUTION

WATER REQUIREMENTS OF CROPS

MAXIMUM PUMP EFFICIENCY

and related irrigation subjects. This issue highlights irrigation problems which may be vital now, and which are important at all times.

PLANT AND SOIL MOISTURE RELATIONSHIPS IMPORTANT TO THE SUGAR BEET GROWER

By JACK HILLS
Field Superintendent, Spreckels Sugar Company

The problems of knowing when to irrigate and how much water to apply are very important to the farmer. He usually arrives at the practical answer to these questions through experience, and learns for each crop and for each of his fields about when to irrigate and how much water to apply. However, there are a few soil-water-plant relationships which, when kept in mind, should be helpful in considering irrigation problems.

The concept of available soil moisture is of prime importance. Experimentation has shown that there probably is no one optimum moisture content of a soil that will provide for maximum crop growth. There is, however, for each soil a range of moisture contents throughout which plants can obtain water with about equal facility. The upper limit of this range is called the field capacity. This is the moisture content that exists after the soil has been thoroughly wet and allowed to drain for two or three days. It is that portion of the water which the soil can hold against the downward pull of gravity. A soil in this condition has ample moisture for plant growth, but equally important it is not water-logged and contains in its pore space considerable quantities of air which is also essential to plant growth.

The lower range of available soil moisture is known as the permanent wilting percentage. The moisture remaining in the soil below this percentage is held so strongly that plants are unable to obtain sufficient amounts and will wilt permanently. For practical purposes, the permanent wilting percentage can be considered to be about one-half of the moisture content at field capacity.

As long as the moisture content of the soil throughout the root zone is maintained between these two limits, plants will be able to obtain an adequate supply of water.

Soil texture is the main determinant of water holding capacity. The lighter and more sandy the soil, the less water it can hold at field capacity. The smaller the soil particles (the heavier the soil), the more water it is capable of holding. Thus, the sandy soils must be irrigated more frequently though with a smaller amount of water for each irrigation.

Sugar beets are a deep, extensively rooted crop. Under favorable conditions, roots will penetrate to a depth of five or six feet. From one to two months after thinning, sugar beet roots should be drawing water effectively from a depth of about four feet. Probably about ninety per cent of the water used comes from the first four feet under most California deep soil conditions. This then is the area that should be kept above the wilting point.

The rate at which a crop will deplete the available soil moisture depends on several factors, namely: soil texture, size of leaf growth and extent of the root system, depth of soil, temperature and humidity. A vigorously growing crop on a light soil under conditions of high temperature and low humidity will rapidly deplete the available moisture to the extent that the first two feet may reach the permanent wilting percentage within five to seven days and plants will begin to wilt. On heavier

(Continued on page 23)

EFFECT OF LOWER WATER TABLES ON PUMPING PLANT CAPACITIES

By JOSEPH K. CANNON
Pump Test Engineer, Pacific Gas and Electric Company

The very existence of California agriculture relies upon water—most of which is available to growers only from their individual pumping plants. During the war years and in the postwar period, many contemplated improvements upon pumping facilities were postponed because of shortages in supplies.

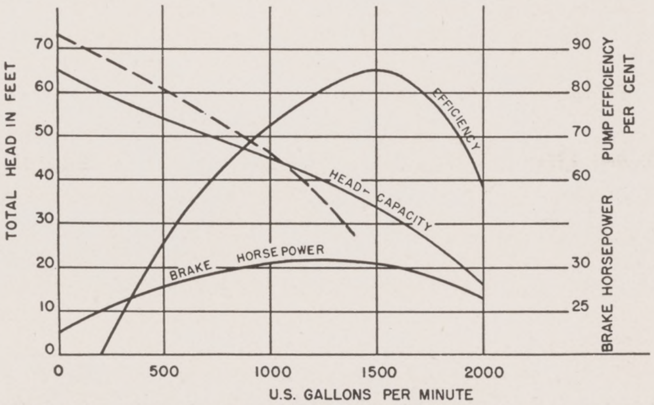
But now well drillers are working around the clock to supply the demand for new wells and more water. This increased draft upon our underground supplies together with a series of dry winters has started a downward trend in underground water levels.

Consequently, farmers are beginning to wonder if they are going to get through the summer safely. Every day we are asked if it is advisable to add ten feet or so to the bowl setting of their deep well pumps before the summer season to avoid a bottleneck later on.

Unfortunately, this is one question that can't be answered by a simple YES or NO.

HOW PUMPS BEHAVE

In order to explain this, let us look at some typical pump curves, as shown in the accompanying illustration.



TYPICAL PERFORMANCE CURVE—DEEP WELL TURBINE 2

These performance curves are for a deep well turbine pump operating at a constant speed. The line sloping downward from the left represents the varying quantities of water delivered corresponding to the respective heads or lifts beginning at the line of zero capacity, which point in this curve shows the shut-off head at the pump at that particular speed.

The shut-off head is the condition obtained when the discharge valve is closed. It represents the maximum velocity head that the impeller will produce at that given speed. As the valve is opened and the flow increases, the pressure-head will drop as noted by the gradually sloping curve. The trend of this curve can be determined only by pump design.

Sloping upward from the left is drawn the efficiency curve, which indicates the relation between the power input into the pump and the useful work performed by it. The highest point in this curve indicates the best performance or "peak." In a pump having sloping head capacity characteristics, the peak is usually at a point where the effective head is considerably less than the shut-off head. In deep well turbine pumps this head will average from 30 to 85 per cent of the shut-off head with the best average around 60 per cent at the point of best performance regardless of speed.

With this characteristic, the horsepower curves will be very flat with their maximum requirements somewhere near the peak. If the pump must operate at any other than the peak performance, the horsepower will decrease but slightly in either direction. This type of pump is very popular in deep well work for operation at constant speeds.

BASIC PUMP THEORY

The useful work performed by a pump is called the water horsepower (WHP) and is expressed by the formula

$$\text{WHP} = \frac{\text{G P M X Lift in Ft.}}{3960}$$

For a given size plant operating at a constant speed, as is the case with an electric drive, the useful work done by the pump, or its water horsepower, may within certain limits be thought of as a constant.

This being true, it is quite evident, both from the head-capacity curve and the formula, that with any increase in head or lift there is a corresponding decrease in capacity.

As a specific example, here is what happened to a 7.5 H.P. plant tested in May, 1946, and again in February, 1948.

Here are the test results:

	May, 1946	*Feb., 1948*
Total Lift	**50.2 ft.**	**54.3 ft.**
Capacity	**360 GPM**	**300 GPM.**

The lift had increased 4 feet or a little over 8 per cent, but the capacity had decreased 60 GPM, or 16⅔ per cent. This 60 GPM decrease in capacity over a 24-hour period would amount to 0.26 of an acre foot.

At first glance this may not seem significant, but consider the effect upon a pump delivering 1500 GPM. If the capacity decreased 15 per cent, the loss of 225 GPM would amount to 1.0 acre foot of water in 24 hours.

Below are the results of tests made upon a 15 H.P. plant in the spring and summer of 1947:

	Spring	*Summer*
Total Lift	**34.0 ft.**	**45.7 ft.**
Capacity	**1180 GPM**	**835 GPM**

The lift had increased 11.7 feet or approximately 13.5 per cent, but the capacity had decreased 345 GPM, or a little over 29 per cent.

Looking at the head-capacity curve again, it is quite evident that for any particular pump the amount of water delivered at a given lift is based upon the design characteristics of the pump impeller. Any decrease in capacity due to an increase in lift can only be regained by either changing the pump or increasing the speed of rotation of the pump. Setting the bowls 10 or even 20 feet lower in the well will not increase the capacity of the pump.

However, in the case of a pump having a very steep head-capacity curve, as shown by the dashed head-capacity curve in the illustration, a drop of 10 or 20 feet in the water level would have less effect upon the capacity than it would upon a pump having not quite so steep a characteristic. In this case, if the pumping water level should drop to or slightly below the bowls, setting the bowls lower in the well would probably be a satisfactory solution as the deeper setting should assure the farmer of a continued supply of water during the summer and the decrease in capacity, because of the increase in lift, would not be great enough to affect his irrigating problems materially.

THE EFFECT OF SPEED

Increasing the speed of rotation of a pump to increase the capacity is not always a practical solution either. Most turbine pumps are driven by a direct connected vertical electric motor and are therefore fixed in speed. Increasing the speed with a belt drive arrangement would probably overload the motor because, according to the fundamental laws of physics, the capacity flow of the centrifugal type turbine pump will vary directly as the speed, the pressure-head will vary as the square of the speed, and the power required will vary as the cube. Therefore, if the speed of the pump is doubled, the flow will be doubled, the pressure-head will be multiplied four times, and the power will be increased by eight times.

Because of these varying characteristics of turbine pumps, it is frequently desirable for the customer, or engineer, to obtain a graphic picture of the relationship between speed, pressure-head, capacity, horsepower, and efficiency of the pump under consideration. These curves can be obtained from the manufacturer upon request.

In dealing with the results of lowering water tables, the following factors should be considered:

1. With water levels dropping, the pumping lift is increasing, and the capacity delivered by the pump decreasing. Setting the bowls lower in the well will keep the pump from breaking suction, in the event the water level in the well is pulled below the bowls when the pump is turned on, but it will not increase the capacity.

2. If, because of the acreage involved, a definite amount of water is required, this capacity at the increased lift will require more horsepower and consequently a new pump or at least a new set of bowls designed to deliver the required amount of water at the increased lift.

WHAT TO DO ABOUT LOWER WATER TABLE

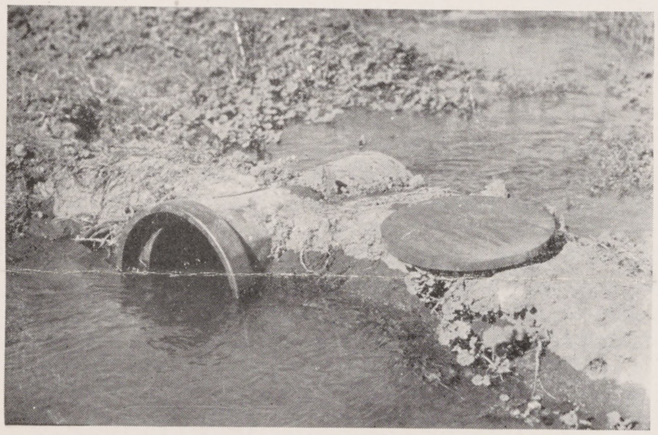
With a deeper bowl setting on your present pumping plant you will be assured of some water, but will it be enough? Consider whether you should rebowl for a higher lift or possibly even go to the next larger size motor with a new pump to meet your needs.

The greatest aid to a farmer's problem of what to do about a lower water table is the experience of his own local pump dealer. Each dealer has the manufacturer's performance curves on the pumps he sells and installs, and is in a position to advise as to whether setting the bowls deeper or changing the pump entirely is the solution to your problem of a lower water table.

In the Sacramento and San Joaquin Valley areas of California, the local electric utility companies maintain a free pump test service for their consumers and can render valuable information on your pumping plant under field operating conditions.

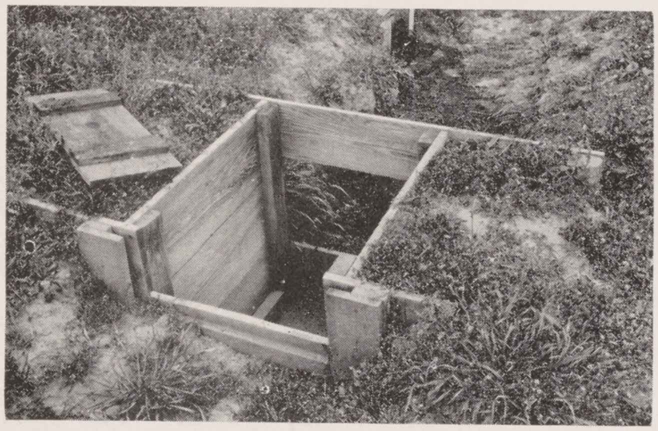
AIDS TO IRRIGATION ECONOMY

FIELD GATES



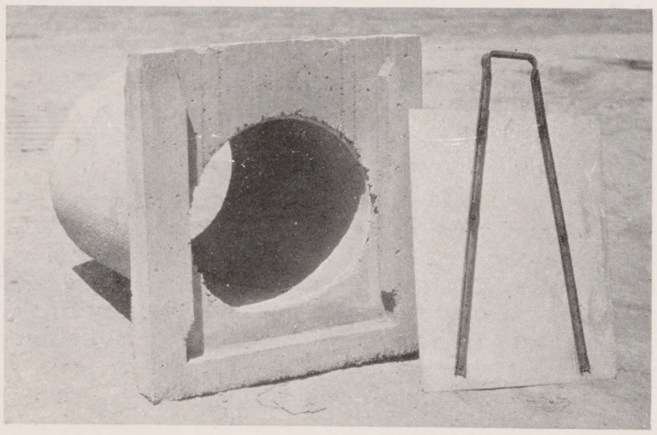
3

FAIR—A section of drainage tile with a wood disk to fit the bell end is low in cost, but lacks adequate control.



4

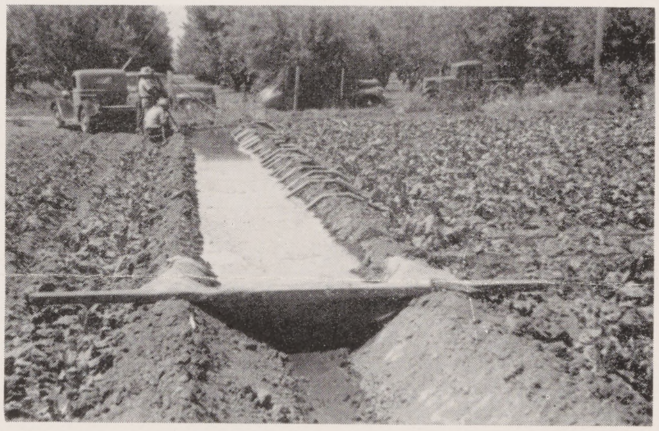
GOOD—The wood box with slide gate costs more, but offers better control. It has, however, a relatively short life.



5

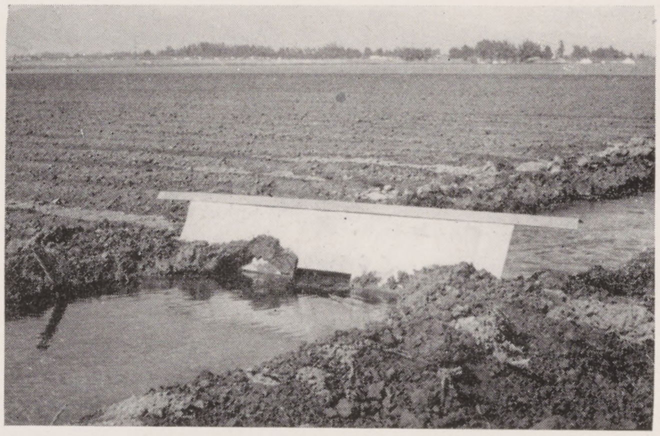
BETTER—A section of cement pipe with cast-on concrete flange and sheet metal slide gate offers permanence as well as good control.

DAMS



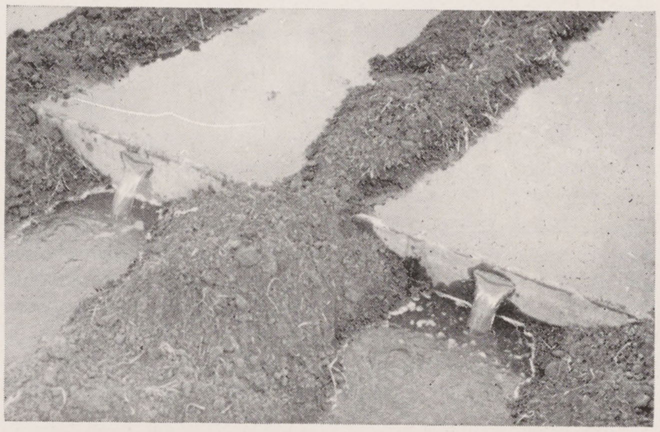
6

Canvas dams control the flow of water in surface ditches where otherwise it would be necessary to construct earth dams.



7

To control the flow of water in field ditches, sheet metal tapoon dams with slide gates are placed at proper intervals.



8

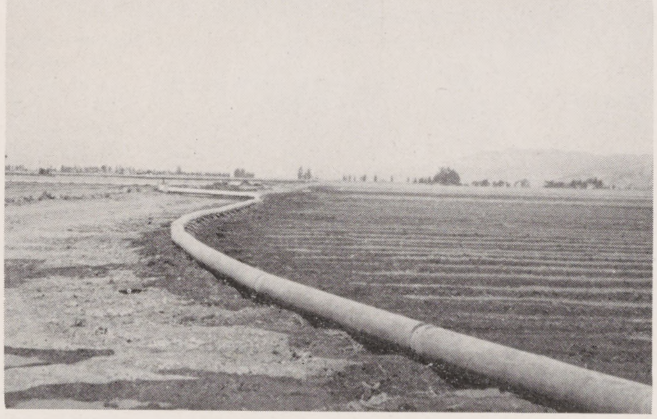
To preirrigate sloping fields for bed planting, furrow-size tapoons prevent washing and afford maximum penetration with minimum runoff.

The object of proper irrigation technique is to put the right amount of water on the right place at the right time. Here illustrated are some of the methods aimed at this object. This material was assembled by W. L. Gerow, Civil Engineer, Spreckels Sugar Company.

DISTRIBUTION

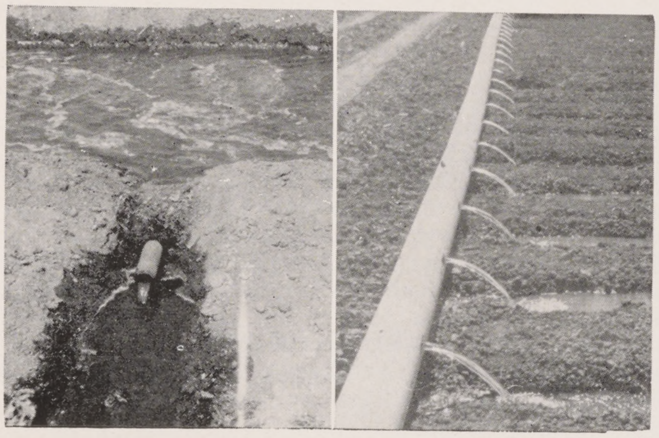
9

Open field ditches are commonly used from which the water is distributed by air brake hose, iron pipes, wooden box pipes, or siphons.



10

Underground pipe lines, together with surface distributing pipes, most efficiently deliver and distribute the water.

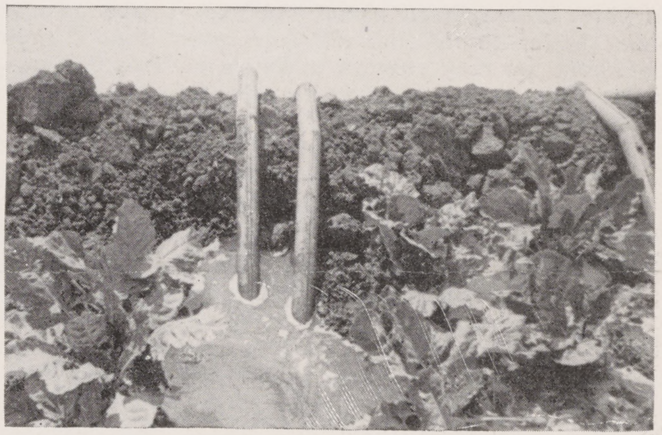


11

LEFT—A furrow-pipe in place.

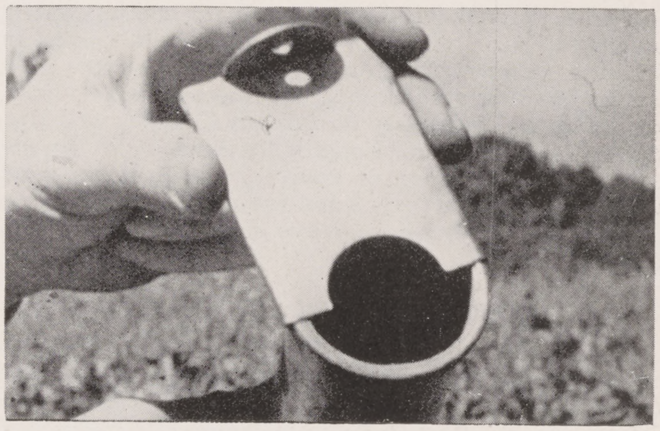
RIGHT—The surface irrigation pipe has a gated hole placed opposite each furrow.

SIPHONS



12

Furrow siphons offer maximum flow control to each furrow. Two siphons per furrow meet the need for long runs or unusually permeable soil.



13

Precise flow control to every furrow is available when slide gates are a part of each siphon.

14

The final adjustment to put the right amount of water on the right place at the right time.

SOME REASONS FOR VARIATIONS IN IRRIGATION PRACTICE

By C. N. JOHNSTON

Division of Irrigation, University of California, Davis, California

Unfortunately for us as irrigators of crops, the medium in which these growing plants root is as variable as anything that could be conceived. As a result, if we are not observant, we may attempt to follow an irrigation procedure in a new area that we have proved satisfactory in an old one, only to meet with failure in the new location. If this happens, we have neglected to study the soil type and contour sufficiently or, what is worse, have not noted the methods adopted by our neighbors who probably have learned by trial and error the program best suited to the area.

Our tools are limited relatively to a few standard units, such as ditches and pipe lines for the distribution of the flow to the sides of the field, delivery gates on the ditches, or siphons, and outlet valves on the pipe lines. In addition, there is the sprinkling system and, in a few areas, the spud ditch which is used to bring the water table up into the rooting zone of the crop by seepage from the ditch itself. All these devices are provided to furnish water to the soil.

We have seen that soil varies from peat, which is wholly organic, to sand, which may be almost pure quartz. In addition, we know that true earth varies in texture from the sands, which are loose and porous, to the clays, which are sticky and relatively impervious to water, and that the contour or general slope of the land varies greatly even in short distances in many places. It is this great variability in the soil type and contour which makes us modify our irrigation practices from one locality to another.

ADAPTING THE TOOLS OF IRRIGATION

We might attempt to list the adaptations of the tools or devices given above and several of the definite soil types. This is not a subject that conforms too strictly to fixed rules, so we will have to generalize frequently. Starting with pipe lines and ditches as listed above, we can derive a table for the three soil types—sand, loam, and clay. There are factors like seepage, contamination by weed seeds, cost, operation simplicity, and others, that are the nature of these water conduits and by which they can be compared (see Table 1). For example, for the factor, seepage, in this table, for the three soil types, the ditch can expect high and wasteful percolation losses where passing through sand, moderate and occasionally high losses through loams, and low to negligible losses through clay. A pipe line through these same soils would experience little or no seepage.

We find four factors in the above comparison which are independent of soil type: cost, contour of land, weed contamination and effect on cultivation practice. The cost of outlets such as ditch structures and pipe line valves are extras over and above the cost of the ditches and pipe lines themselves. It is difficult to compare them since they serve a specialized type of conduit. Some of the effects resulting from soil type, such as washing, come after delivery of the water by these outlets.

TABLE 1
COMPARISON OF DITCH AND PIPE LINE IRRIGATION IN RELATION TO VARIOUS FACTORS

Factor	*Soil Type*	*Ditch*	*Pipe Line*
Seepage	Sand	High—wasteful	Slight to none
	Loam	Moderate—occasionally wasteful	Slight to none
	Clay	Low—negligible waste	Slight to none
Operation simplicity	Sand	Washing a problem	Less washing than ditch
	Loam	Some washing—may be high	Limited washing to none
	Clay	Little or no washing	None
Maintenance	Sand	Difficult to keep in shape	None
	Loam	More stable than sand	
	Clay	Relatively stable—keeps shape	
Rodent destruction	Sand	Often not suitable for burrowing (caves in)	None
	Loam	Burrowed readily and frequently	
	Clay	Burrowed readily and frequently	
Life	All Types	Must be remade frequently to plug rodent holes and control weed growth for all soil types	Long—15 to 20 years or more
First cost	All Types	Low—few cents per ft. (3c to 10c)	Higher—from 55c for 8″ to $1.50 for 18″ (approx. price laid in field)
Weed contamination	All Types	Always a hazard, sometimes serious	None
Interference with cultivation	All Types	Often definite obstruction to cultivation	Below ground—little or no interference
Contour of the land	All Types	Must have fall toward point of delivery	Can disregard grade of land if all points are below elevation of supply, which may be under pressure.

There are several different methods for applying water to the soil, such as the use of basins, furrows, checks, borders, and sprinklers, and we can draw up a comparison in table form (Table 2) for varying contour or grade conditions and for the three selected soil types. Basins, checks and borders are basically alike, being reasonably flat areas with earthen levees around them that hold the water flooded over them until it infiltrates the soil. Basins are generally smaller, such as the square-leveed areas about individual trees. Borders or checks are, in general, long and narrow with the slope down the length in the direction of irrigation. The cross slope (the narrow way of borders and checks) is restricted to 2 feet or less between the levees. Thus the cross slope sometimes controls the spacing of levees and sometimes the available water supply controls.

TABLE 2

RATE OF WATER SUPPLY AND LENGTH OF RUN FOR VARIOUS TYPES OF IRRIGATION AND SLOPES OF LAND

Type of Irrigation	Slope of land in ft/100′	*Coarse Sandy Soils*		*Medium Silt Loam*		*Very Heavy Clay Soils*	
		Supply needed	Length of run	Supply needed	Length of run	Supply needed	Length of run
Basin	0 - 2′	20 cfs/acre		5 cfs		2 cfs	
	2 - 5′	"		"		"	
	5 - 8′	"		"		"	
	8 - 12′	"		"		"	
Border or Check	0 - 2′	1.5 cfs/10′	220′	.5 cfs/10′	550-880′	.3 cfs/10′	to 1,000
	2 - 5′	width	220′	width	550-880′	width	to 1,000
	5 - 8′		220′		550-880′		to 1,000
	8 - 12′		220′		550-880′		to 1,000
Furrow	0 - 2′	.02 cfs each	220′	.01 cfs ea.	440-660′	.005 cfs ea.	880′
	2 - 5′	.02 cfs each	contour	.005 " "	220-440′	.003 " "	550′
	5 - 8′	.02 cfs each	furrows 2%	.002 " "	110-220′	.002 " "	330′
	8 - 12′	.02 cfs each	slope				
Sprinkler	0 - 2′	2″ per hour		.5″ per hour			
	2 - 5′	2″ per hour		.5″ per hour			
	5 - 8′	1.5″ per hour		.4″ per hour			
	8 - 12′	1.0″ per hour		.3″ per hour			

Variations from any of the selected soil types toward another imply a change in irrigation practice as tabulated toward the second soil type requirement. Thus, a sandy soil that borders on being a loam would be irrigated more like a loam than a sand.

Several devices listed in paragraph two above, such as siphons and spud ditches, are somewhat specialized in nature. The siphon conducts the water over the ditch bank to the field, eliminating the cutting of ditch banks and has been found to save much labor as a result. The spud ditch finds favor in peat areas where the water table is already reasonably high. They simply saturate the surrounding peat mass with water by rapid percolation through the porous peat.

It costs in the neighborhood of $3.00 to pump one acre-foot of water where the total lift is 100 feet. If this total lift is in the well and we have a sprinkling system requiring a pipe line pressure of about 40 pounds per square inch at the pump discharge, we increase the pumping cost roughly another $3.00 per acre-foot. In contrast, some gravity supplies cost as little as 50 cents per acre-foot and some even less. The cost of gravity or ditch water depends upon the gross cost of the project and how rapidly it is being amortized, generally.

PLANT AND SOIL MOISTURE

(Continued from page 18)

soils under conditions of lower temperatures and higher humidity, plants may not wilt until the available moisture is depleted down to the third or fourth root.

There are several ways of precisely determining the amount of available moisture in a soil; however, they all require more or less specialized equipment and are not practical for the individual farmer to do for himself. However, every farmer can become more efficient in the use of his irrigation water by examining his sub-surface conditions and learning to correlate them with observations of plant growth. By the use of a soil tube, auger or shovel, one can learn how the soil looks and feels at field capacity and the permanent wilting percentage by taking samples after irrigations and at times when plants wilt. With such a simple procedure, a farmer can learn many useful characteristics of his own fields, learn when he should start the next irrigation and how deep his water must penetrate.

IRRIGATION CALCULATIONS

The figures and example which follow are helpful in approximating the time required to irrigate a given field to the required depth with a given flow of water. The calculations do not take into account possible penetration difficulties and the excessive loss of tail water. Loss through evaporation is sometimes a factor, but this is not taken into account here.

Approximate Depth of Penetration of One Acre Inch of Water on Various Dry Soil Types*

Sandy	*Loam*	*Clay*
12 in. or more	**6-10 in.**	**4-5 in.**

One gallon per minute = 0.00221 acre inches per hr.
One acre inch = 27,154 gallons.

Example: To approximate the length of time required to secure penetration to a depth of three feet on a 40-acre field of sandy soil using a well that pumps 1,000 gallons per minute:

> 0.00221 × 1,000 = 2.21 acre inches pumped per hour.
> To obtain a three-foot penetration on sandy soil, it requires three acre inches. For 40 acres, it requires 40 × 3 = 120 acre inches of water.
> The time required to cover the 40 acres would be 120 ÷ 2.21 = 54.3 hours.

*From "Simplified Irrigation Water Measurements," by the Agricultural Extension Service, University of California, Bakersfield, California.

IRRIGATION FACTS TO REMEMBER

1. Irrigation runs should not be so long that adequate penetration cannot be secured on the lower end. Generally, the sandier the soil the shorter the irrigation run should be.

(Concluded on next page)

2. Excessive penetration beyond the root zone robs plants of valuable nutrients.

3. Roots will not grow into dry soil. A field should be wet to a depth of at least five feet early in the season so that normal root development may take place. Thereafter, irrigations need only be as heavy as is necessary to replace the depleted moisture.

4. Attempting to make plants "root down" by starving them for water will decrease yields. When plants wilt, essential growth processes that increase weight and sugar content are greatly slowed down.

5. When a soil is dry, not only do the plants suffer directly from a lack of water, but also because the formation of essential nitrates by soil micro-organisms is greatly hindered.

6. Cultivation conserves moisture mainly through killing competitive weeds and has little effect in preventing evaporation of soil moisture from the surface.

RELATIVE WATER REQUIREMENTS OF VARIOUS FIELD CROPS

By NORMAN VOGT

Field Superintendent, Spreckels Sugar Company

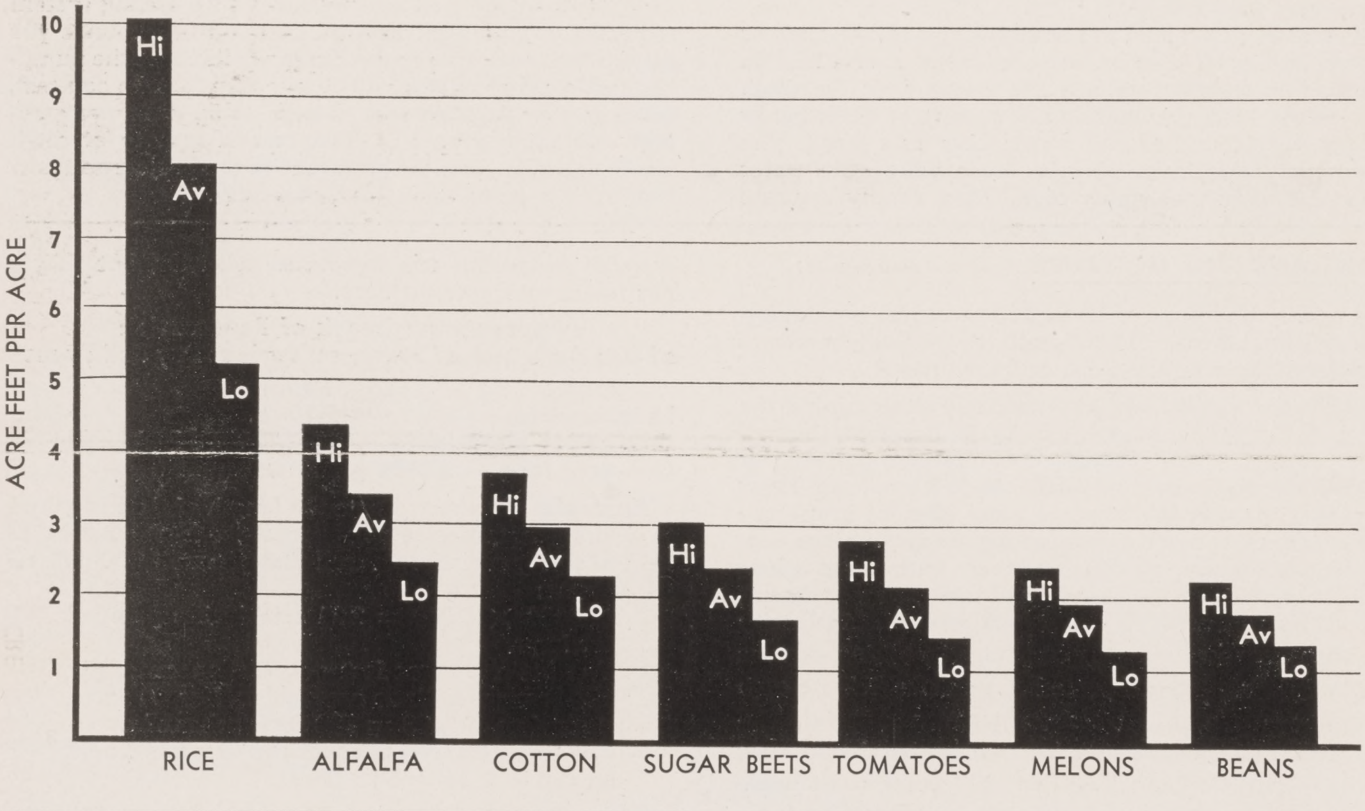
Published information on the water requirements of field crops in California has been scarce, and the data have appeared to be conflicting or even contradictory.

Such inconsistency in observed requirements is quite natural. It must be realized that California's soil and climatic conditions vary over a range so wide that the difference in individual crop requirements is often smaller than the difference for the same crop due to soil or climate characteristics alone.

Nevertheless, it must be a fact that certain crops require more or less water than other crops grown under identical soil and climatic conditions. By sifting a considerable amount of evidence, it was possible to eliminate, to a large extent, the influences of soil and climate, and to assign average values of water requirements to each of several field crops.

Data were collected which applied to the Sacramento Valley from Rio Vista to Colusa and the west side of the San Joaquin Valley from Crows Landing to Mendota. For these data we are indebted to the University of California, the Pacific Gas and Electric Company, and the Firebaugh Canal Company.

The results were plotted on the bar chart shown below. In order to reveal the great range for each crop, the bar representing that crop was drawn with three steps, representing high, average and low water requirements.



The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

Editor
AUSTIN ARMER
600 California Fruit Bldg.
Sacramento, Calif.

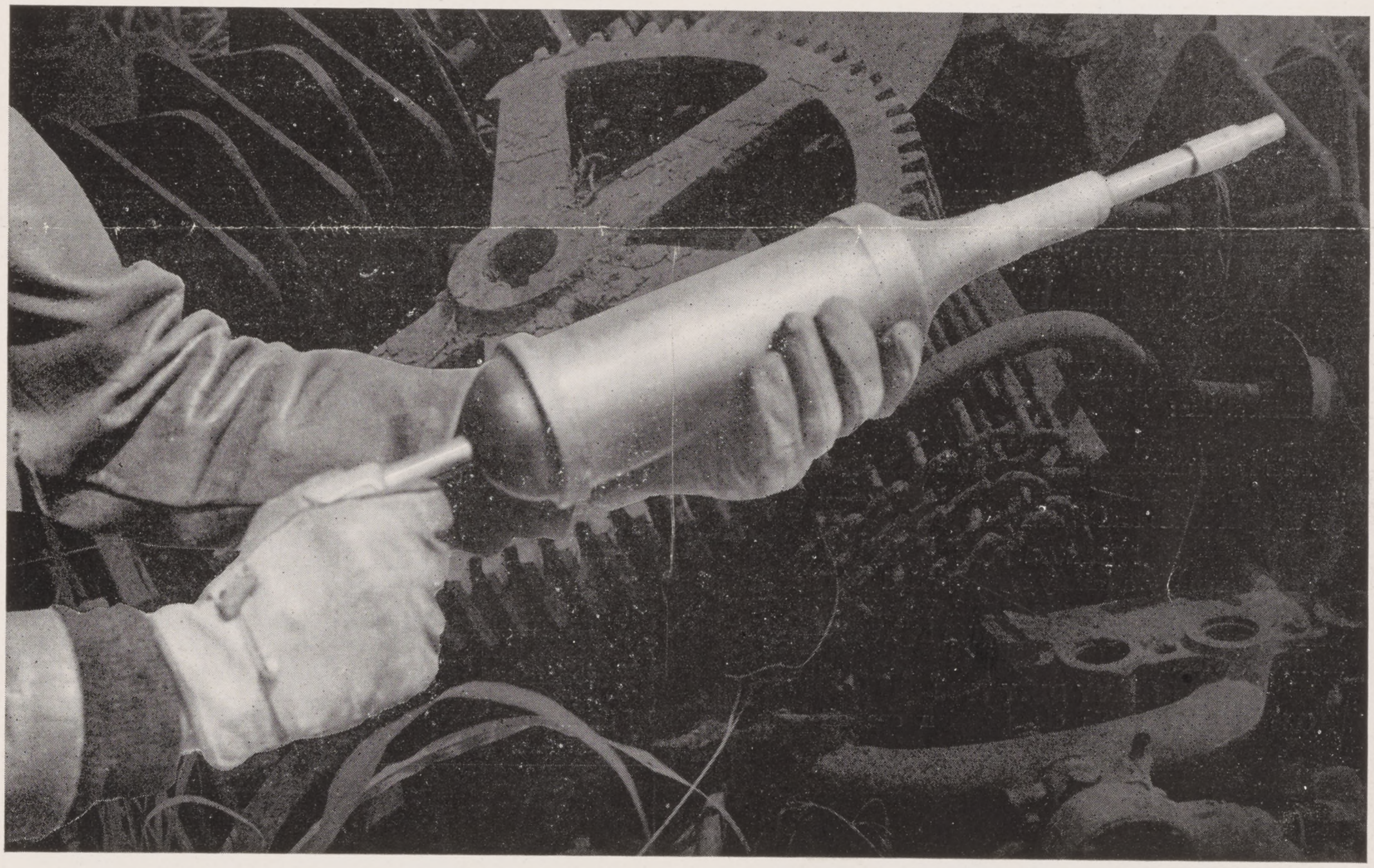
Associate Editor
NAIDA BECKETT
2 Pine Street
San Francisco, Calif.

SALINAS PUBLIC LIBRARY

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XII JULY-AUGUST 1948 No. 4



15

WAGE WAR ON WEAR

It pays big dividends to operators of beet harvesters. Proper attention to servicing details will:

INCREASE HARVESTER OUTPUT

CUT MAINTENANCE COSTS

REDUCE FIELD LOSSES

This issue features some important items of harvester maintenance and operation.

HONEY-DEW

FUELS AND LUBRICANTS FOR AUXILIARY ENGINES

By L. M. RORDEN, *Product Acceptance Department*
Standard Oil Company of California, San Francisco

Because of the current widespread use of sugar beet harvesters, interest has been directed to the proper fuels and lubricating oils to be used by their engines. The requirements of an auxiliary type engine are not very different from those of the ordinary gasoline engine. However, because of the more or less continuous operation of this power plant without attention, a tendency may exist to overlook the servicing it requires for consistent good performance. Knowing that the motor is using good products is assurance that it can provide the good service expected of it. This article is an explanation of desirable qualities of oils and gasolines and applies not only to their use in the harvester engines but in gasoline engines in general.

In recent published material the oil industry has indicated that a variety of lubricating oils are now available for specialized services for both automotive and Diesel engines. These lubricating oils fall into three general quality classifications:

REGULAR TYPE

This is an uncompounded oil and is adapted primarily for lubricating gasoline engines which operate at light loads and moderate speeds.

PREMIUM TYPE

This is usually a mildly compounded lubricating oil and is designed for use under normal loads for which the engine is designed and in high speed automotive service.

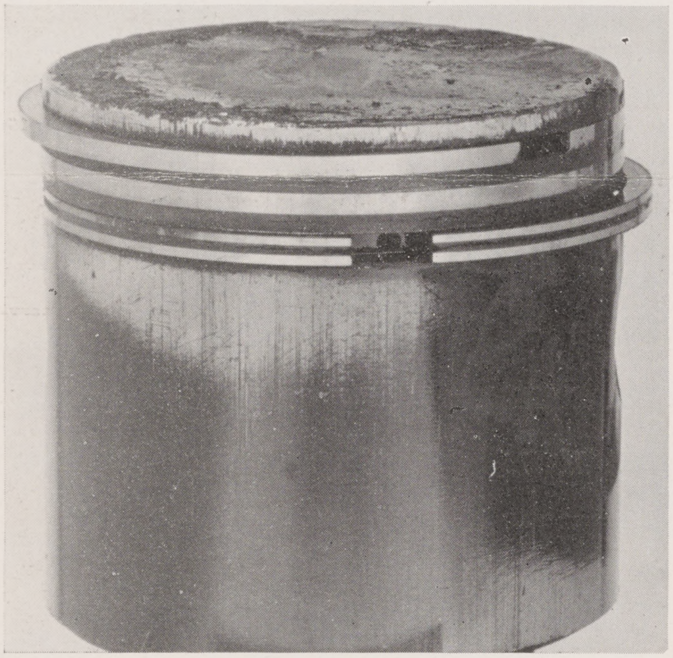
HEAVY DUTY TYPE

Oils falling in this classification are all compounded for resistance against oxidation and bearing corrosion, and usually have high detergency qualities. These oils are intended primarily for heavy service and high temperature operation in both gasoline and Diesel engines.

Compounded oils containing detergents have the ability to prevent the deposition of materials which are formed as a result of oil oxidation and the products of fuel combustion. Oxidation inhibitors help the oil to resist harmful effects of high temperature, and the corrosion inhibitor fortifies the oil to overcome any tendency to attack some alloy bearing surfaces at the high temperatures and speeds encountered. Babbitt bearings are not subject to corrosion but may fail by fatigue which is usually caused by overloading, misalignment, or some mechanical imperfection in the bearing or journal surfaces. Copper-lead bearings are more resistant to fatigue failure and will withstand higher loads but may become corroded (the lead is removed chemically) if a lubricating oil which is not sufficiently inhibited is subjected to excessive temperatures in the engine or on the bearing surface itself. Various other alloy bearings have been developed for heavy service. Occasionally it is difficult to distinguish between fatigue and corrosion failures because both may assume a pitted appearance. In these cases it may be necessary to use a powerful microscope to identify the type of failure.

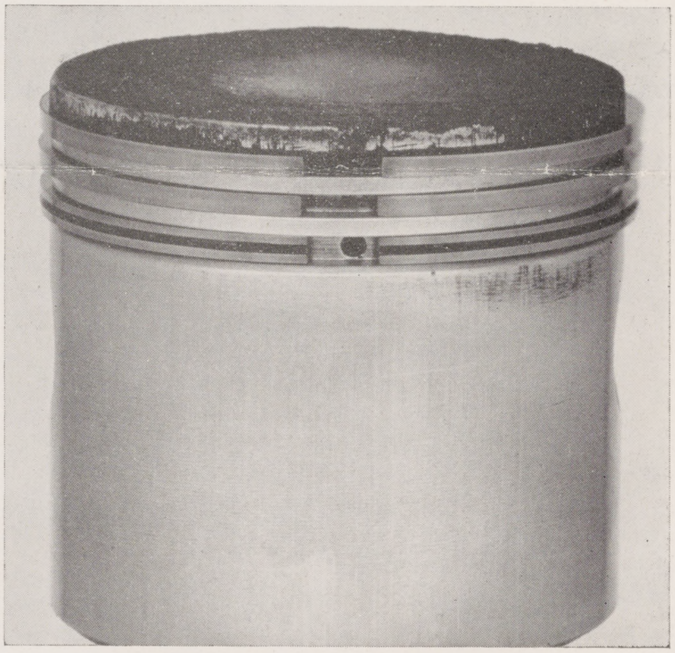
All types of engine lubricating oils are available in a variety of viscosity grades which are referred to as SAE grades. The SAE grade designations range from 10 to 70. 10W and 20W oils are also available and are designed to provide adequate lubrication at low atmospheric (winter) temperatures. The lighter oils (low SAE grade numbers) are generally used in new or rebuilt engines and as the mechanical parts wear, higher SAE grades may be used to compensate in part for the increase in clearance

(Continued on page 31)



16

A piston operated with an UNCOMPOUNDED oil.
Carbon deposit—hard and gritty
Rings—partly or entirely stuck
Skirt—coated with "varnish"



17

A piston operated with a COMPOUNDED oil.
Carbon deposit—soft and sooty
Rings—entirely free
Skirt—entirely clean

PROPER HARDFACING FOR LONGER MARBEET PLOW LIFE

By PHIL WELTY
Rankin Manufacturing Company

One of the highest maintenance cost items pertaining to Marbeet harvester operation is the wear of standards, plows and shares—especially in those districts where soils are highly abrasive. With increased harvester efficiency has come an increase in the operating speed of the machines, creating extreme frictional wear of those parts operating in the ground. Hence the subject of proper hardfacing is of great interest to Marbeet owners.

The general procedure for adequate protection against abrasion has been the result of many months of experimenting in which the engineers, welders and service men of the beet sugar processors have cooperated with the Rankin Manufacturing Company with the result that the useful life of standards, plows and shares has been markedly increased over the past few years. The cost savings to operators of Marbeet harvesters as a result of proper hardfacing are very significant, and it is the purpose of this article to outline the materials and methods of application which lead to the greatest profits from hardfacing.

Perhaps the most important lesson learned in the course of these experiments has related to the combining of two types of hardfacing material on the same tool. The cutting edges or points are overlaid with Rantung, a tube rod composed of a soft metal sheath packed with powdered tungsten carbide particles, preferably sized through a 60 to 100 mesh screen. This material is available for acetylene application, and for those who prefer to use the electric arc, it may be obtained as a flux coated rod which provides a stable arc.

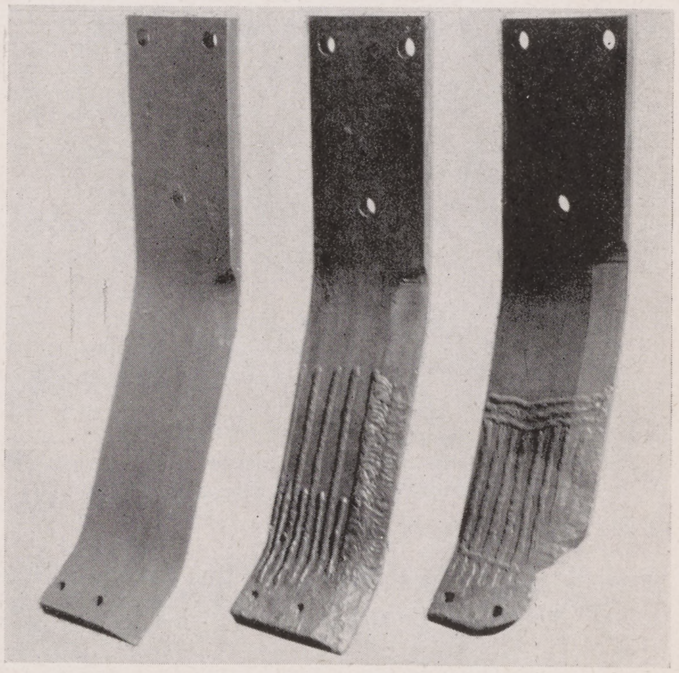
The area of the wearing parts subjected to secondary abrasion, especially that portion immediately behind leading edges, can be protected by applying stringer beads at approximately half-inch intervals. These stringer beads do not require the extreme abrasion resistance of Rantung, and the less costly material, Ranite type "C," holds favor for this application. The Ranite type "C" is an electrode with a metallic coating which produces a stable arc and a small amount of splatter, plus the added feature of 80 per cent recovery. It is quite easy to apply, forms a smooth bead, and deposits a surface with a hardness of 60 to 62 Rockwell. Beads having this hardness offer a high resistance to the abrasion of soil which has been previously broken up by the harder Rantung facing on the leading edges of the wearing parts.

A valued feature of Ranite type "C" is the fact that parts on which stringer beads of this material have been applied can readily be cut with an acetylene torch in the event that replacing of plow tips or other repair work is necessary. Further, the properties of Ranite "C" permit the repeated hard surfacing of parts without producing a tendency to check or pull away at the original bond zone. The strength of this bond is particularly good when the material is applied to cast steel parts such as are used for Marbeet shares.

The pattern of application wherein the two materials are combined has much to do with the life expectancy of a hardfaced part. While the photographs show the general application pattern on Marbeet parts, it should be pointed out that the critical, leading edges are first given an application of Ranite "C," over which Rantung is applied sparingly. The fine mesh deposit of Rantung appears to scour very nearly as well as the Ranite type material, but the actual impact of hard soil particles is broken by the rough cutting edge whose tungsten carbide particles are second only to diamonds in hardness. Referring to the photographs, it will be seen that the stringer beads of Ranite are spaced so that about one-half inch of bare metal is left between beads. This prevents the soil from undercutting the base material and also allows earth to fill in between the ridges so that the actual wearing surface is the retained earth rather than the base material.

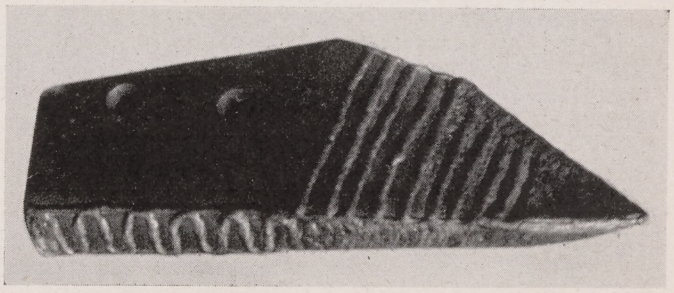
On shares, the point and bottom trailing edges are about equally subjected to wear. These areas should be faced with Ranite "C," taking every precaution to cover

(Continued on page 32)



1 2 3

1. **A new Marbeet front plow, before hardfacing.**
2. **The same plow, properly hardfaced. Ranite Type "C," overlaid with Rantung, is applied uniformly on all direct wearing surfaces (leading edge, bottom corner and lower end, both sides), while the vertical stringer beads of Ranite prevent secondary abrasion.**
3. **This plow had been properly hardfaced, but was left in service so long that economical rebuilding is impossible.**



19

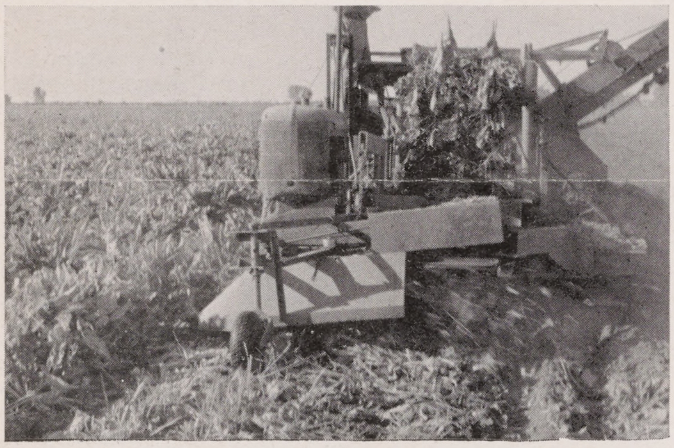
A field-proved pattern of hardfacing for a Marbeet share. Solidly surfaced areas are Ranite Type "C," overlaid with Rantung, and the stringer beads are Ranite Type "C." All work done with electric arc.

HARVESTER IMPROVEMENTS FOR 1948

MARBEET

By E. F. BLACKWELDER

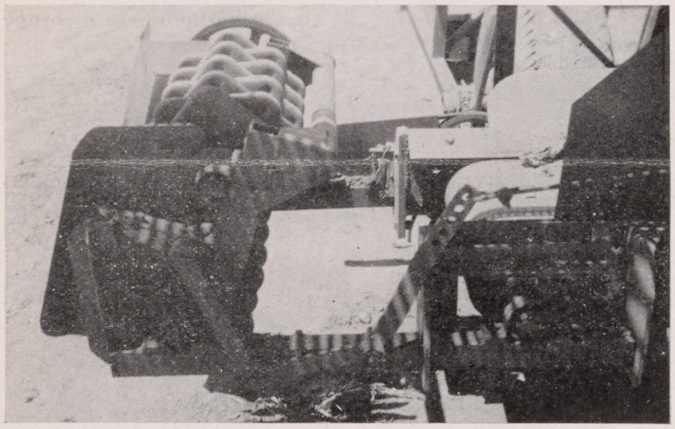
Nearly everyone who has operated a sugar beet harvester has made suggestions for its improvement. Many of these suggestions have been tried out, and the ones illustrated have real merit.



20

The improved Marbeet defoliator makes mechanical harvest practical in fields with excessive top or weed growth. Requiring no attention from the operator, it disintegrates all growth down to within a few inches of ground level, and makes possible good harvester performance in fields otherwise impossible to handle mechanically.

Field tested and available on order.



21

This new top windrowing attachment for the Marbeet harvester removes most of the dirt from the tops, and deposits a compact 4-row windrow easily straddled by the trucks.

A crank on the operator's platform lowers the unit on alternate rounds, so that tops from the second round are cleaned and deposited directly over the top windrow from the first round. (Shown here in the raised position.)

Field tested and available on order.

INTERNATIONAL

By J. L. HIPPLE

Manager of Engineering, International Harvester Company

The International sugar beet harvester which is being offered to the trade this year presents some improvements over the one produced in 1947. No basic change has been made in the machine itself. It is well supplied with overload clutches which release when excessive loads are placed on different units in the machine. The 1948 machines have been provided with a master slip clutch on the belt pulley which gives additional protection to all moving parts of the machine. The size of the roller chain on the topper unit has been increased to lengthen its service life.

From a functional standpoint two very desirable improvements have been made. The receding finger top flinger drum was mounted in a rigid position with relation to the topping disk in the 1947 machines. In beets having excessive top growth, and also in fields that were heavily invested with weeds and grass, it was found that much of the stoppage was due to clogging of material between this flinger unit and the topping disk. This top flinger unit is mounted on a swinging arm on the 1948 machines and is held in its normal working position under spring pressure so that it can move upwards within certain limits to allow large amounts of material to pass through without clogging.

In the matter of top disposal, an improvement was made in the mounting of the baffle apron. This apron is arranged so that it can be set in three lateral positions with relation to the topping unit from the tractor seat. This makes it possible for the driver to place four rows of tops in a windrow by opening his field in lands, making two round trips to pull four adjacent rows. By this method four rows of tops will be left in a loose windrow free from dirt. The topping disk supplied with this year's machine is of the notched type which has been found to be much more efficient in topping brittle beets without breaking.

The unloading cart remains unchanged except that more flights have been added to the unloading chain apron for faster unloading. Some of the drive shafts have been heat treated for more strength and longer life, and better bearings employed in the cart elevator cross shaft. Deflector rods have been added to the puller standards to prevent loss of small beets.

The procedure established last year in running one of the production machines on an extended test is being followed in 1948. Last year this machine started in the Imperial Valley in May, moved to the San Joaquin Valley in July and was later moved to the Woodland area in September and kept in operation until late in November. The advantages of a test like this are that two or three normal seasons' run can be had on the machine in one season, which serves to develop any weakness. Constant engineering effort is being put forth to improve both the functional qualities and durability of this beet harvester. Experience gained on these machines operating all the way from Ohio to the Pacific Coast during the past three years has proved that they will harvest beets in any type of soil, under any moisture condition and in any amount of vegetation.

MECHANICAL HARVESTING IN WEEDY FIELDS

By AUSTIN ARMER

Agricultural Engineer, Spreckels Sugar Company

Articles have appeared in the Spreckels Sugar Beet Bulletin from time to time suggesting methods of combating weed problems at harvest time. Until recently no systematic method of satisfactory mechanical harvest in weedy fields had been developed, but experiments conducted late in 1947 and during the 1948 Imperial Valley harvest have provided sufficient information so that it is now possible to set forth a fairly definite procedure.

CLASSIFYING WEED AND TRASH PROBLEMS

Observations in a great many fields at harvest time have indicated an extremely wide variety of weed and trash problems, but these can be divided into two general classifications, grouped in such a manner as to indicate the type of control required.

The first group includes those field conditions which interfere with mechanical harvest by presenting large bulky masses of tall weeds, sugar beet bolters and excessively large tops. Among the weeds included in this classification are all varieties of stalk weeds, sour clover, Johnson grass and similar tall growing varieties.

The second classification includes the harvesting problems arising from tightly matted, low growing weeds, as well as heavy deposits of wilted beet leaves and petioles lying in the furrows. Weeds contributing to this type of problem are morning glory, Bermuda grass, wire grass and many others whose growth habits produce dense mats of fibrous material lying close to the ground.

CONTROL METHODS FOR SPECIFIC WEED CONDITIONS

The first of the foregoing classifications presents a weed problem which can almost always be satisfactorily solved by using a defoliator on the Marbeet harvester. This accessory, available for either single or double row models, has a rapidly rotating, fan type blade mounted on a vertical drive shaft and positioned over the beet row or bed adjacent to that being harvested. Requiring no attention from the harvester operator, the defoliator disintegrates all bulky growth and leaves only those beet tops and petioles which lie four to eight inches from the ground surface, according to the adjustment. During subsequent rounds of the harvester, the plows, coulters and pick-up wheels are operating in ground which has been cleared of all bulky growth, and which presents a beet row whose tops are clipped to a uniform height.

22

The Marbeet defoliator in action. Two beet rows have had all weeds and top growth removed to within 8 inches of ground level. On the next round, these defoliated rows will be easily harvested, and no bulky trash will interfere with spiking or topping.

Operating with the defoliator, the Marbeet harvester not only does a better job of spiking, but is also capable of more accurate topping, reduced delivery of trash to the load and marked freedom from shutdown time occasioned by clearing out masses of weeds and trash.

The second weed problem classification, that of matted, low growing weeds, can in most cases be most satisfactorily solved by preceding the harvester with a rotary beater.

These beaters are rapidly becoming a standard equipment item on well-implemented farms, since they find a great many uses elsewhere than in the beet field.

23

This Olson Roto Beater is scrubbing the furrows free of low-growing, matted weeds and trash. Subsequent beet harvesting will be improved, both in recovery and quality of topping.

It must be pointed out that the effectiveness of a rotary beater depends to a large extent on its adjustment and method of operation. Several beet growers have found that Marbeet and International harvesters do their best work when the flails of the rotary beater are either shortened or removed from that part of the shaft directly over the beet rows. With this arrangement all trash in the furrows, together with long, dried beet petioles, is adequately disintegrated, but sufficient top growth is retained for good spiking in the case of the Marbeet harvester and good topping and top disposal in the case of the International harvester. If the crowns of the beets are beaten so much as to remove all tops, leaving the beets baldheaded, many of the smaller beets are left in the ground due to poor spiking by the Marbeet harvester.

AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE

The foregoing suggestions have been made in order to assist those growers who find it necessary to use mechanical harvest under excessively weedy conditions.

It was not the intention of this discussion to encourage the neglect of weed control before harvest time. The fact remains that the greatest loss in weedy fields arises from growth competition to the best plants and that for this reason the yield of a beet field is seriously impaired if weeds are permitted to get the upper hand.

THE IMPORTANCE TO THE GROWER OF DELIVERING CLEAN BEETS

By WILLIAM CONNER
Superintendent, Woodland Factory

Growers who deliver beets heavily contaminated with foreign material suffer a very real financial loss. Any who may fail to realize the importance to them of delivering clean beets, free of trash, large rocks, and tramp iron, may benefit materially from the facts brought out in this discussion.

Our factories have means of removing a reasonable amount of foreign material and improvement is continually being made, but during the last two years or so, especially since the advent of mechanical harvesting, the amount of such material has, at times, been far more than a reasonable amount.

The average tare for all beets delivered to the Spreckels Sugar Company in 1939 and 1940 was 2.15 per cent. Last campaign, 1947, the average tare was 5.13 per cent, an increase of approximately 3.00 per cent over the years 1939 and 1940.

This 3.00 per cent increase on the tonnage of beets harvested for Spreckels Sugar Company in 1947 amounted to about 34,000 tons of extra tare.

While such an amount of trash presents a serious problem to the factory operators, growers also suffer increased costs by delivering beets containing excessive trash, dirt, rocks, or tramp iron. Such increased costs to the grower may occur from these three causes:

1. Reduced factory capacity, with consequent reduction of the rate of delivery by growers.
2. Delays at the beet dump.
3. The grower's direct cost of hauling tare.

REDUCED FACTORY CAPACITY

A brief description of a part of the factory process will explain why the factory capacity may be effected.

In processing, the beets are sliced into strips (commonly called cossettes) about ⅛ inch square in cross section. The sliced beets are loaded into steel tanks and water is percolated through the bed to remove the sugar by diffusion and leaching.

If the slices are not well formed and firm, percolation is not only slowed down but also is less efficient and more water must be used to remove the same amount of sugar. Also, ragged slicing ruptures a large percentage of the plant cells. In the diffusion process such ruptured cells allow more non-sugar materials to diffuse, thus producing a raw juice with a greater percentage of impurities. This adds to the difficulty of refining.

24

One day's accumulation of trash removed from the flumes at the Woodland factory. If this trash had been eliminated at the source, the factory could have processed up to 10% more beets.

To produce clean-cut cossettes it is essential to have clean beets. Fibers from any foreign material such as leaves, grass, or weed roots will hairpin over the cutting edges of the slicer knives. Cossettes produced under such conditions will be ragged and torn. Any foreign material such as rock, tramp iron, pieces of wood, etc., which dull the knives will have the same effect.

The difference in capacity of a factory between working good cossettes and working mediocre or poor cossettes is about 10 per cent.

What does this mean to the grower? It means this 10 per cent difference during the coming campaign in the capacity of the three Company factories could amount to between 800 and 900 tons per day, or approximately 12 days in the length of the harvest period. To be able to harvest more tons per day will reduce the growers' cost, but more important, to be able to finish harvest two weeks earlier in the fall is often the difference between harvesting during dry weather or harvesting in the mud.

DELAYS AT THE BEET DUMP

Such delays may be caused in two ways. First, the beets may be so interwoven with grass and weeds that it takes excessive time to get them to slide out of the truck. Second, foreign matter such as chain, bars, or other metal objects, may break the dump equipment.

At the Woodland factory last campaign, truck loads were received so entangled with weeds and trash it took in excess of 20 minutes to unload them. The normal time for unloading a truck is less than 2 minutes.

On another occasion at the Woodland factory a load of beets contained a pinch bar which was unobserved as it was dumped into the hopper with the beets. The bar caught in the hopper feeder belt and tore the belt for some distance before the belt could be stopped. This necessitated a delay until repairs could be made.

In past campaigns 600 trucks have been unloaded at the Woodland factory dump in 600 minutes. At this rate, a delay of only a few seconds per truck can reduce the daily delivery appreciably; any waiting of the trucks at the dump increases the grower's cost.

THE COST OF HAULING TARE

This very important direct cost to the grower may be expressed in two ways.

First, growers paid in 1947 the *total cost* of hauling 34,000 more tons of dirt and trash than in 1939 and 1940.

Second, growers' *gross* hauling costs in 1947 were 3 per cent more than in the 1939-1940 period.

In the above statements, *total cost* and *gross* hauling costs have been emphasized, since the Company pays no hauling allowance on dump screenings.

* * *

Summarizing, there are three sources of extra cost to the grower when beets with excessive trash or other foreign material are delivered to the factory. These are: reduced factory capacity, delays in unloading the beets, and the added cost of transporting the extra tare.

There are practical methods for reducing tare in machine harvested beets. Some of these methods are described in this issue, and may prove of real value to growers with trash problems.

FUELS AND LUBRICANTS

(Continued from page 26)

between the wearing surfaces. The higher viscosity oils usually maintain a lower oil consumption rate. The amount of oil used is primarily influenced by the mechanical condition of the engine itself and the speed at which it is operated rather than the viscosity of the oil.

Occasionally reference is made to the viscosity index (V.I.) of an oil. This is a number taken from a scale established by the American Petroleum Institute and used for comparing different oils with respect to their rate of change in viscosity as temperature changes. For example, two SAE 30 grade oils of different viscosity indices may have the same viscosity at 100° F. but at engine operating temperatures the higher viscosity index oil will have a higher viscosity (thicker) than the other. Viscosity index as such is not an indication of oil quality. The quality of an oil is dependent upon the crude from which it is made, the refining process used and the type and amount of compounding which has been added.

The load imposed on the harvester engine should govern the type of oil used. In general a premium type should provide good lubrication. If the engine is run at high loads and temperatures for long periods at a time a more highly compounded heavy duty type oil is preferred. The correct SAE grade is usually specified by the engine manufacturer. This is influenced by the design and construction of the engine and the type of service for which it is intended. Difficulties which are caused by mechanical defects or badly worn parts cannot be relied upon to be improved by using a different type or more viscous oil.

It is difficult to establish a definite time at which the oil should be drained from the engine, inasmuch as the deterioration of the oil is influenced by service time, engine condition and temperatures, and the type and amount of contaminants in the oil. Water, raw fuel, dust and metal may find their way into the oil. Some oil insoluble materials (oxidized oil, fuel soot, etc.) may be formed from the oil and gasoline during operation and these are sometimes also referred to as contaminants. If an oil filter is used it will remove the larger particles, but it is necessary to drain the oil from the engine to remove other materials which may not be circulated or may pass through the filter. Detergent type oils have the ability to prevent the deposit of much of these materials on engine parts and to keep some contaminants in such small sizes as to permit them to pass through most filters. These are held in suspension in the oil and are so small as to be carried through the bearings without any harmful effects. The retention of these materials in the oil accounts for the rapid darkening in color of many such oils and the only means of removing the particles kept in suspension is by draining them from the crankcase. The function of these oils is to keep the engine clean by removing these materials from the engine in this manner. Although a detergent compound keeps materials in the oil which might otherwise be allowed to deposit inside the engine, such an oil ordinarily should not be left in the engine longer than a regular type if the best results are desired. It is good practice to drain the oil after from 60 to 120 hours of operation, depending on the load to which it was subjected. The oil level should be checked each day.

The time at which oil filter elements should be replaced is regulated by the amount of material it removes from the oil. Good practice is to replace the filter element when the oil is changed. A filter should never be permitted to become plugged or completely solid with foreign material, as the oil then cannot flow through it and its function has been lost. The oil in engines without filters should preferably be drained at more frequent intervals.

SELECTION OF GASOLINES

Gasoline is a mixture of complex petroleum hydrocarbons which have boiling points covering a distillation range from approximately 100° F. to 400° F. (from "start" to "end point"). This contrasts with water, which has no boiling point "range"—the start and end point are the same—as it boils or distills completely at one temperature (212° F. at sea level). The distillation characteristics of a gasoline define its overall volatility.

The components are chosen principally in terms of their volatility characteristics and their anti-knock values. The portions that boil off first are called "light ends" and those boiling at the higher temperatures "heavy ends." The art of designing a motor gasoline to meet the engine requirements involves careful balancing of many factors. For example, if the gasoline is not sufficiently volatile the engine will be hard to start. If it is too volatile the engine may stall or fail to start (after it has warmed up) because of vapor lock (insufficient amount of fuel getting to the cylinders).

Following are brief discussions of how gasoline properties are adjusted to meet the engine operating requirements:

STARTING

Ease of starting is obtained principally by providing "light end" components which evaporate in the first part of the gasoline distillation range. These vaporize readily in the carburetor and will ignite easily even though the engine is cold. In cold weather gasolines are usually provided with extra "light ends" to facilitate starting.

WARM-UP

Warm-up is principally affected by the components of the gasoline in the middle part of its distillation range. By adding more volatile components to this portion of the distillation range, faster warm-up will result.

VAPOR LOCK

Vapor lock, like ease of starting, is affected by the amounts of components present in the first part of the distillation range. If excessively volatile stocks are used vapor locking will result when the fuel system reaches operating temperatures.

CRANKCASE OIL DILUTION

Crankcase oil dilution is related to the so-called "heavy ends" contained in the gasoline. If excessive amounts of heavy ends are present, oil dilution will result because some of the fuel will not vaporize and burn and will find its way past the pistons into the crankcase.

FUEL CONSUMPTION

Theoretically, fuel consumption is dependent upon the amount of heat produced when the gasoline is burned in the engine. Practically, however, it is principally related to the overall distillation characteristics of the gasoline. By regulating the distillation range for proper qualities of starting, warm-up, vapor lock and power, good fuel consumption is obtained.

POWER

Power, like fuel consumption, is principally related to the overall volatility of the gasoline. Good power per-

(Continued on next page)

formances will be obtained if the gasoline is designed to contain a satisfactory balance of "heavy ends."

DETONATION

Detonation is eliminated by providing gasoline components with sufficiently high anti-knock value. This is not directly associated with volatility. A very effective way of improving anti-knock value is by the addition of tetra-ethyl lead.

COMBUSTION CHAMBER DEPOSITS

Combustion chamber deposits are affected by lesser known properties of gasoline, such as gum content. Gasolines with high values of gum may result in deleterious deposits.

Engines in motor car service impose the most severe requirements on gasolines since they are constantly being accelerated and decelerated. Inversely, engines which are used as auxiliary service and are operated at more or less constant speed and power impose relatively mild fuel requirements.

Premium fuels are designed to give premium performance with respect to the above characteristics under the most severe types of operation as imposed by motor cars. For the operation typical of auxiliary engines, it is doubtful whether any difference would be noted between premium and regular grade gasolines. This is primarily influenced by the specific design of these engines and the service for which they were intended. Analysis of combustion chamber deposits frequently show evidence of tetra-ethyl lead. However, leaded gasolines are provided with materials which are highly effective and minimize this tendency. Their function is to assist the deposit forming ingredients to be discharged out the exhaust.

In order to obtain the maximum performance of high quality fuels and lubricants, good operating maintenance should be practiced. It is well to consider a number of precautions in operating gasoline engines subject to dusty atmosphere, high loads and high temperatures. Air cleaners should be serviced whenever the operating conditions dictate, depending primarily on the amount of dust which the cleaner has to remove from the air going into the engine. This procedure should not be overlooked, inasmuch as an inefficient or inadequate air cleaner may permit dust to enter the engine and cause excessive wear in a relatively short time. To insure good performance of the air cleaner it is recommended it be serviced frequently. Two types of air filters are in general use: A dry type using a fiber or metal wool which requires cleaning and reoiling. The oil in an oil bath type should be replaced each day with the proper quantity of oil. If the oil level is permitted to drop, the filter will not adequately clean the air. It is important to follow the manufacturer's recommendations as too light an oil or over-filling may cause excessive engine deposits.

It is desirable for good service maintenance to keep the crankcase breather clean in order to permit the hot vapors which accumulate to escape. Good crankcase ventilation is an important factor in minimizing deposits and assists in prolonging the usefulness of the oil. Radiators and cooling water should also be kept clean to permit the cooling system to function properly. In this regard it is well to maintain engine water temperature in the range of 160° F. to 180° F. to obtain best performance from both the fuel and the lubricant. Long idling periods should be avoided; it is better to shut the engine down than to allow it to idle a long while, as this may contribute to crankcase dilution which in turn is harmful to the oil.

Care should be taken to maintain adequate cleanliness of storage tanks, transfer containers and filling nozzles for both the fuel and lubricant to avoid excessive wear of the engine parts and unnecessary deposits within the engine. Many precautions and special controls are observed at the refineries and during the distribution of the petroleum products in order to supply the customer with products of good refinement and cleanliness. If proper handling procedures and storage facilities are maintained and adequate operational maintenance is practiced by the operator, the care exercised in producing the high quality products will not have been lost.

PROPER HARDFACING *(Continued from page 27)*

thoroughly, even to the extent of overlapping as passes meet at their edges. The Rantung, applied over this deposit, bonds tightly and gives just the necessary wear resistance at these critical points.

For soils which are only moderately abrasive, Ranite may be used alone. But experience has shown that combinations of Ranite and Rantung as above described are the most economical in the long run. Badly worn parts are difficult and expensive to rebuild. Dull edges increase the draft horsepower, resulting in reduced production and improper lifting of the beets from the ground. Perhaps the most vivid lesson taught by the experience of Marbeet harvester users is that properly hardfaced wearing parts provide their maximum economy only when used to the extent that they can be resurfaced with a minimum of hardfacing material. Maintenance costs and overall harvester efficiency are severely impaired if the hardfacing materials are permitted to wear so far as to expose the base material. Continued use of plows, shares and standards after the base material has been exposed results in costly rebuilding or replacement, and to a large extent cancels the savings available through a carefully worked out hard-facing program as above outlined.

A CORRECTION

We apologize to Mr. C. N. Johnston, author of "Some Reasons for Variations in Irrigation Practice," which appeared in the May-June issue.

On page 22, four lines up from the bottom of the second column, "- - - 2 feet - - -," should read "- - - .2 foot - - -."

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

Editor
AUSTIN ARMER
600 California Fruit Bldg.
Sacramento, Calif.

Associate Editor
NAIDA BECKETT
2 Pine Street
San Francisco, Calif.

SALINAS PUBLIC LIBRARY

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XII SEPTEMBER-OCTOBER 1948 No. 5

25

TWO CROPS—

Tops and roots—grow in every field of sugar beets. Profits from tops can be increased by proper methods of harvesting and processing.

WINDROWING AND PASTURING
HARVESTING AND DEHYDRATING
CHOPPING AND ENSILING

are a few of the methods of top utilization now under intensified study by cooperating agencies. Their work is described in this issue.

HONEY-DEW

BEET TOP RECOVERY BECOMES A MAJOR EXPERIMENTAL PROGRAM

By JOHN LEAR, *Livestock Specialist*
Spreckels Sugar Company

The conservation and efficient utilization of sugar beet tops and leaves draws nearer to realization as machinery is developed to harvest and store this beet by-product economically.

Several methods of top harvest are being developed which would allow the individual grower to choose the one best suited to his needs.

In the following paragraphs some of these methods under investigation are described. There are four main types or methods of handling green tops which we are observing on grower farms.

First, the siloing of the whole top which includes leaves and crowns, these being the most valuable for feed. There are two types of machinery employed for the same result, the first being a combination of the latest windrowing attachment built by The Blackwelder Manufacturing Company, and a spiked drum top pickup. The windrowing attachment places four rows of tops together in a ribbon narrow enough to be straddled by beet trucks. After windrowing, the spiked drum is pulled down the row, picking up the tops, placing them on a series of shaker rolls which remove excess dirt and clods. A conveyor belt then carries the tops onto the truck which tows the machine.

Second is the "Windmill" beet leaf harvester as developed by The Blackwelder Manufacturing Company. This consists simply of a rotating blade similar to the one employed on the Marbeet defoliator. Turning at 2750 r.p.m. within the lower end of a circular pipe, the spinning blade creates its own suction, cutting the leaves at any desired height and blowing them onto a truck or wagon. The "Windmill" already has proven itself capable of cleaning tops and tremendously heavy trash off the beet row prior to the harvest of the roots. After the roots are loaded the crowns and remaining petioles can be picked up with a spiked drum mentioned earlier.

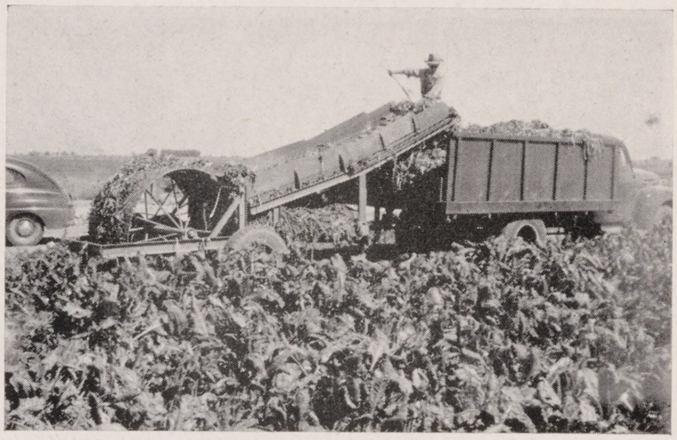
Third on the list is the Locke Green Crop harvester which the designer proposes to use in harvesting whole leaves only. This machine is adjustable to any row spacing, cuts the leaves at the desired height and elevates the product onto a truck.

On the Locke project, the beet leaves are to be mixed with corn silage at the first of two pit silos to make a mixed product with improved palatability and flavor. The second silo is to be filled with leaves, but molasses will be added and mixed at the rate of one hundred pounds to a ton of leaves. This latter method will demonstrate the effects of molasses on green tops as an aid in the ensiling process.

Fourth is the dehydration of beet leaves, making a product available for poultry feed or other high protein mixed feed.

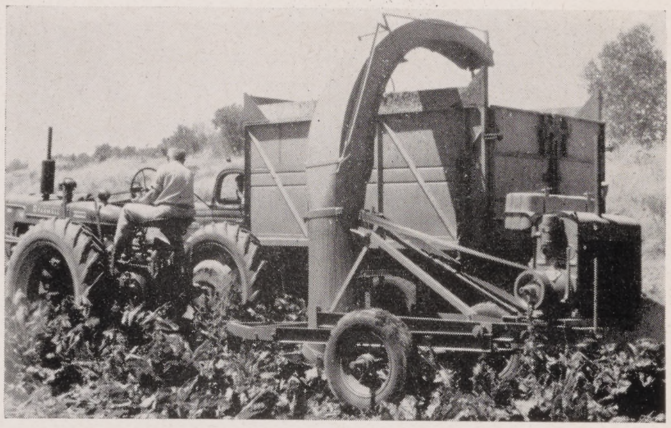
This method has been tried but there are certain obstacles encountered in trying to chop the leaf into pieces small enough to dry evenly in the ordinary commercial drum dryer used by alfalfa dehydrators.

(Continued on page 40)



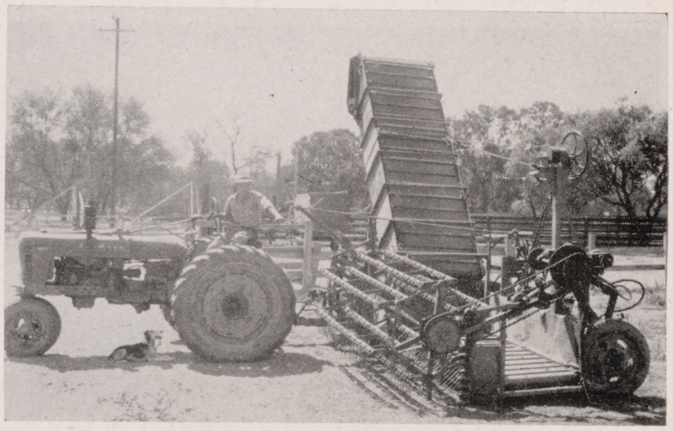
26

This top pickup-loader was built by Frank Caudill of Brawley. Operating on the principle developed by Lloyd Schmidt in 1944, this ingenious machine is ground powered, picks up a full windrow of tops, and delivers them to the truck which tows it.



27

The Blackwelder Suction Defoliator chops the beet leaves and blows them into a truck.



28

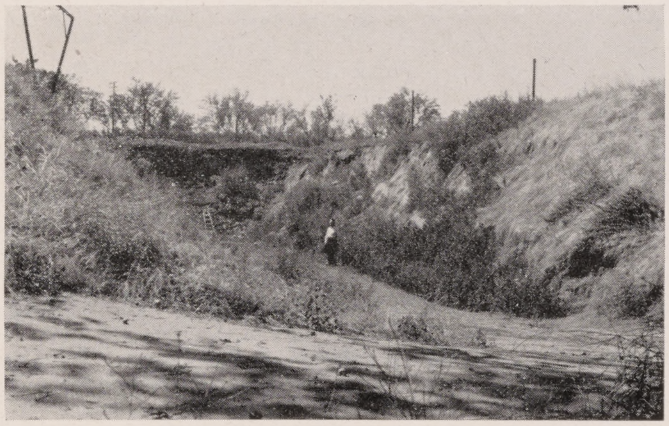
The Locke green crop harvester.

29

Filling a pit silo with beet tops; covering with straw, canvas, and soil. *(Photo courtesy of Agricultural Extension Service.)*

30

After defoliating, the beets retain the petioles and some leaves, and are readily harvested by machine.



31

A pit silo ready to receive beet tops.

METHODS AND MACHINES FOR BEET TOP RECOVERY

By AUSTIN ARMER, *Agricultural Engineer*

Spreckels Sugar Company

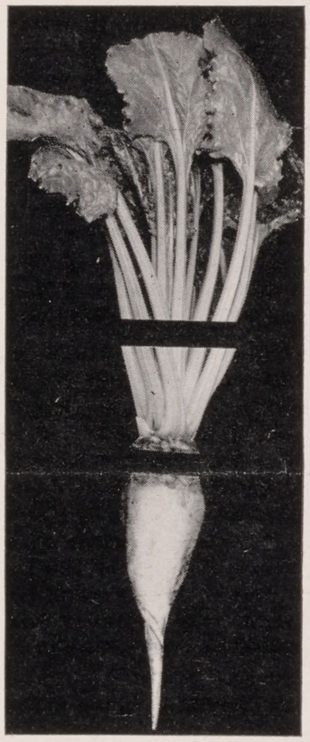
The current interest in the recovery of sugar beet tops has led to the development of a surprising number of devices and systems to bring about the complete and economic recovery of this valuable crop.

It must be stressed that these developments, being so recent, are of necessity experimental in nature, and are described here not with the idea of recommending their immediate adoption, but with the thought that growers interested in this important subject may be inspired to accelerate their own top recovery program.

CLASSIFYING TOP HANDLING METHODS

If we examine a complete beet plant with the idea of cutting it into sections, each of which has a distinct use, we are apt to divide it into:

1. The leaves.
2. The crown plus stems.
3. The root.



32

There are three useful parts of each sugar beet plant.

This method of breaking up the beet plant into three useful products rather than merely tops and roots, as has been our customary thinking, was done in order to fit in with existing machines which could either be used "as is," or altered to harvest mechanically each of the three parts of the beet plant as above outlined.

(Continued on next page)

(Continued from preceding page)

THE HARVESTING AND UTILIZATION OF SUGAR BEET LEAVES

Recent successful green crop harvesters have shown their value in such crops as spinach and peas. They also have been used for defoliating dense tops in sugar beet fields in preparation for mechanical harvest of the roots.

The Marbeet defoliator used with great success last year in preparing fields with dense top growth for harvest has been developed into a suction defoliator ("Windmill") for delivering the chopped beet leaves to a following truck.

These two machines offer a means of not only preparing the field for the efficient harvest of the roots, but also a means for delivering a large quantity of leaves at a low cost. The ready availability of this large supply of leaves has led to investigations concerning their utilization, and very promising work is now being conducted on two principal methods of conservation. These are ensiling and dehydration.

Ensiling of beet leaves alone can be successful only if sufficient carbohydrates are present to promote desirable types of fermentation. Thus a successful ensilage program using leaves alone must contemplate the addition of molasses or other carbohydrates.

The dehydration of beet leaves presents a much more difficult problem than the dehydration of less moist foliage, such as alfalfa. While alfalfa as field chopped may contain from 72 to 78 per cent moisture, beet tops may exceed 90 per cent in moisture content. Based on the dry weight of product, the beet tops require approximately two and one-half times as much fuel to produce a pound of dry product as is required to produce a pound of dried alfalfa meal. Notwithstanding this high fuel requirement, a number of experiments are being carefully conducted to determine the cost and nature of beet leaf meal prepared in a manner similar to alfalfa meal.

Another very interesting approach to the problem of producing beet leaf meal is that of first pressing out most of the juices from the leaves, and dehydrating the press cake. This process, if successful, will not only greatly reduce the fuel requirement per pound of product, but will yield a beet leaf meal high in Carotene and free of laxative mineral salts, which are removed along with the expressed juices. This combination of pressing and dehydrating beet leaves is perhaps the most advanced of the methods now under consideration and holds promise for the development of a highly specialized feed stuff, having for its raw material the abundantly available sugar beet leaves.

With the advent of improved windrowing attachments for beet harvesters, the pasturing of beet tops, either complete or defoliated, should become more attractive, yielding higher gains to the feeder and permitting greater income to the beet grower.

Under investigation at this time is a system of ensiling a mixture of leaves and crowns. While offering a product no different from that of ensilage made from the entire beet top, this method permits the two-stage system of topping, whereby the leaves are first removed to enable the harvester to operate efficiently, after which the crowns with attached stems are picked up from the windrows by means of the spike drum type of pick up. By chopping the crowns and stems in an ensilage cutter, all possibility of chokes is eliminated, and the addition of chopped crowns to the ensiled leaves it is hoped will provide sufficient sugar for desired fermentation.

HANDLING OF TOPS FROM THE WINDROW

It has become a foregone conclusion that any mechanical beet harvesting operation wherein top utilization is contemplated will leave reasonably undisturbed windrows of tops on the harvested ground. In many cases these windrows will be pastured, and will yield reasonably high weight gains, but not without the many expenses incidental to handling cattle or sheep during pasturing. Further, pasturing of beet tops in the field presents a bad timing situation. It is necessary to feed a large number of animals for a short period, and this is inevitably more costly than feeding a lesser number of animals over a longer period of time.

In order to accomplish the storage of either complete or defoliated beet tops, mechanical pick up from the windrows is definitely indicated. The machines best suited to this job are the spike drum top pick up, the conventional windrow pick up baler, and the pick up forage chopper.

Maximum retention of nutrients and vitamins can be had only if the tops are picked up and preserved very shortly after harvesting. Thus, the spike drum and forage chopper types of pick up lend themselves well to an ensilage program.

When beet tops are sun cured in the field, and baled before the leaves have had a chance to dry out completely and shatter, a high recovery of nutrients is possible even though there may be some loss in vitamins. Baling has in its favor the relatively inexpensive and readily available machine, together with a product which can be stored over fairly long periods of time without the need for costly silos.

GENERAL CONSIDERATIONS

After reading this discussion up to the present point, the reader is apt to wonder what the author is driving at and just what he is trying to recommend. The author would answer this question by saying he recommends that method of top recovery which most closely fits into the individual grower's program. For example, the grower of a large sugar beet acreage whose interests are so diversified as to include an established cattle feeding program might best utilize his tops by pasturing them in his own fields. On the other hand, a small grower or group of growers whose fields are adjacent to a dairy might well consider an arrangement whereby baled or siloed beet tops were made available over a long period to the dairy cattle.

Those methods of top utilization which call for a high degree of processing, such as beet leaf meal produced by pressing and dehydrating, are suitable only for growers who can enter a working agreement with a custom dehydrator.

With the availability of so many methods of beet top utilization at hand, growers who have familiarized themselves with these methods must surely envision increased profits from beet tops by using that method which most nearly fits in with their circumstances.

WHAT'S AHEAD FOR SUGAR BEET GROWERS

By GORDON LYONS, *Executive Manager*

California Beet Growers Association

33

The editor of this bulletin has asked us to prepare an article dealing with the outlook on sugar prices and such other phases of the highly ramified sugar picture as would assist sugar beet growers to a better understanding of the position of sugar beets today and in the reasonably near future.

This is a tough assignment because it calls for some crystal ball gazing of the first order, and we have no extrasensory abilities that we know about. However, someone said the other day that our neck had been out so many times on such a variety of subjects that said neck must long since have become impervious to both the axe and the noose. So, here it is—out once more.

SUGAR IS BIG BUSINESS

At today's market the annual sugar bill for our nation alone would be well over a BILLION dollars, not including the value of large quantities of liquid sugar, corn sugar, sugar syrups, sorghum and molasses that help to satisfy our collective sweet tooth.

Unfortunately the domestic sugar producing areas (18 beet producing states, 2 cane states, Hawaii, Puerto Rico and the Virgin Islands) supply only about 61 per cent of our requirements. So the remainder must come from foreign countries, principally Cuba and the Philippines.

Because in normal times there is usually a world surplus of sugar, and therefore foreign producers are ready sellers in the U. S. market, it is necessary to protect our domestic producers against periodic dumping of foreign sugars at disastrously low prices. This protection formerly was provided by sugar tariffs but is now accomplished by federal legislation known as the Sugar Act of 1948, which is the successor to legislation originally enacted in 1933 and renewed and amended through the intervening years.

Often referred to erroneously as a direct subsidy, the Sugar Act has brought stability to the sugar industry through direct control of production, and more indirect, but nonetheless effective, price control. The argument that this legislation provides a direct subsidy to domestic sugar producers hardly holds water in the light of the fact that the excise tax it levies on all sugar manufactured in the U. S. is sufficient to make all payments to producers, pay the cost of administering the act and still leave a NET annual revenue to the U. S. Treasury of more than eleven million dollars.

As is so often the case when an industry is benefited by federal legislation such benefits are provided at a price. In this case, the price to sugar growers is mandatory wage provisions and compliance with any restrictions that may be imposed on production.

WILL THERE BE ACREAGE QUOTAS?

Production of individual growers in any area supplying our market is restricted only when it is found that such area has produced in any one year an amount of sugar beyond its quota plus a normal carryover. This restriction is accomplished by setting up in the year succeeding such excess production a formula which allots to each individual grower an acreage based on a percentage of his history of sugar beet production and on the history of the land he is farming.

In 1947, production of the beet area was above the quota of 1,800,000 tons of sugar (raw value) allotted to it under the Sugar Act. Earlier this year it appeared that the beet quota would again be exceeded in 1948. In that event, restrictions would have been imposed upon beet growers in 1949. However, the latest estimate is that beet sugar production for 1948 will not exceed 1,600,000 tons of sugar. Therefore, there should be no need for restrictions in 1949, and we are informed by U. S. D. A. officials in Washington that no such restrictions are contemplated. *Consequently growers may plan to plant such acreage in 1949 as they may desire to contract with the sugar companies.*

What may happen with respect to restrictions in 1950 will depend, of course, upon actual production in 1949.

WHAT ABOUT PRICES?

Everyone in the industry knows, of course, that government support in the form of minimum guarantees per ton of beets was discontinued in 1947. Therefore, beginning with the 1948 crop, the industry is returning to the practice in effect before the war of sharing between growers and processors the average net returns from sugar sales during a specified sales year. (In the case of the 1948 crop, this sales year is from August 1, 1948, to July 31, 1949.) In addition, growers who qualify for them will continue to receive conditional payments under the Sugar Act of 80 cents per 100 pounds of sugar produced, or $2.58 per ton of 17 per cent beets.

As this article is being written, the price of sugar is $7.75 per 100 pounds, cane base, but a lot of things can happen during the next twelve months which would affect sugar prices. For example, a while ago we said that sugar is Big Business, and where there is Big Business, we usually find some skulduggery afoot. Now we do not imply, nor would we want any of our readers to infer, that anyone in the sugar industry would stoop to skulduggery, but we are not so sure about some others who are very much interested in sugar. Even now a rather numerous and influential group is using every means at its command, including political pressure, to persuade the Secretary of Agriculture to permit larger supplies of foreign sugar to enter our market, which of course would mean lower prices. Such a movement has great public appeal because sugar is an important item in practically everyone's diet. For this reason it also has political appeal. And it naturally has the support of foreign sugar producing interests who would benefit handsomely from larger quotas in our markets.

Obviously, representatives of the sugar industry must vigorously oppose all such efforts on the part of others to profit at its expense, and this is just one of the many jobs which the California Beet Growers Association undertakes as a routine part of its duties in protecting and promoting the welfare of California beet growers.

(Continued on page 40)

50th ANNIVERSARY CAMPAIGN SUCCESSFUL

Beet Sugar Week, August 9 to 14, is over. The results? Well, as of even date almost two million people in Northern California have had the opportunity to become aware of the importance of the beet sugar industry and the value of the sugar beet to our agricultural economy. In the 17 counties, where sugar beets are grown for Spreckels, civic leaders, chambers of commerce, merchants associations, mercantile establishments, financial institutions, farm organizations, the press, the radio, all cooperated to make this campaign a success. The efforts of Spreckels growers and the active participation of the California Beet Growers Association played one of the most important parts in the program.

When the Spreckels Sugar Company arranged the 50th Anniversary campaign the objectives were: (1) to sell more Spreckels Honey Dew sugar in more retail grocery stores, (2) to persuade customers to specify and buy Spreckels Honey Dew, (3) to make certain that grocers continue to buy Spreckels Honey Dew sugar.

The number one objective was certainly obtained. On July 6, our sales representatives started calling on the major retail stores located in the Sacramento and San Joaquin valleys and in Santa Clara, San Benito, Monterey and Santa Cruz counties. Actually 1250 stores were visited and Spreckels Honey Dew was placed in more than 800 groceries. This means that percentagewise the distribution of our sugar was increased by more than a thousand percent. Starting July 26 our sales representatives covered the territory a second time and found that many stores had re-ordered Spreckels Honey Dew and in numerous cases retailers had received their third order. Grocers, who in the past thought that beet sugar would not sell, now are convinced that consumers will purchase sugar produced from a local crop.

The number two objective, which was to persuade customers to specify and buy Spreckels Honey Dew sugar, was obtained by the wide publicity. Resolutions by civic and farm organizations, proclamations by mayors, editorials in newspapers and radio broadcasts advised consumers that the purchase of Spreckels Honey Dew means more money for the growers in their community and consequently directly benefits local business economy. To supplement this publicity the Spreckels Sugar Company conducted a "Favorite Recipe" contest during the anniversary campaign, and 1079 women bought Spreckels Honey Dew in order to enter the contest. (It was necessary for the participant to send in the front white section of a Spreckels 5 or 10-lb. sugar bag with each entry.) Of major importance was the individual efforts of Spreckels growers who not only contacted food stores, but also put on drives to have their friends and acquaintances ask grocers for Honey Dew.

At this time the third objective, which is to make certain that grocers continue to buy Spreckels Honey Dew sugar, is uppermost in our minds. Preliminary reports from our sales representatives indicate that most grocers are continuing to order our sugar. However, we can't sit back and feel that we can coast for an extended period of time on our efforts during the last few months. We must set up a new set of objectives: (1) Retain and increase distribution of Spreckels Honey Dew Sugar in grocery stores in the 17 sugar beet growing counties; (2) Convince the thought-leaders in our own back yard that they must continue to support the beet sugar industry; (3) Extend our efforts to other parts of the West in order to obtain maximum distribution for Spreckels Honey Dew in our own market.

The entire Spreckels Sugar Company staff is continuing to promote sales. There has been no letdown since "Beet Sugar Week." We urge our growers also to continue to talk about Spreckels Honey Dew sugar to everyone with whom they come in contact—*particularly grocers.*

YOUR AGRICULTURAL EXTENSION SERVICE

By WAYNE F. WEEKS

Extension Specialist in Sugar Beets

34

The Agricultural Extension Service was organized as an aid in diffusing among farm people useful and practical information on subjects relating to agriculture and Home Economics. Since its beginning in 1914, the California Farm Advisor system has become a very important part of the agricultural life in 48 counties of the state. The Agricultural Extension Service is an integral part of the University of California College of Agriculture. Its personnel are members of the staff of the College and, with the resources and facilities of that institution behind them, are in a position to be of much help to sugar beet growers as well as to farmers in the other 200 odd branches of agriculture in California.

HOW THE AGRICULTURAL EXTENSION SERVICE OPERATES

The Agricultural Extension Service is an educational organization. Its services are available to those who want it. Its responsibility to the College of Agriculture is to serve as a pipe-line for information throughout the state. Extension has the task of taking the results and findings of research and experimental work and passing them along to farm people. Unless these findings are put into practice on the land by farmers, the research work of the College of Agriculture and the U. S. Department of Agriculture is of little value to society. There are literally hundreds of research projects under way. When these projects are completed, and new methods, techniques, and materials are developed, it becomes the responsibility of Extension to see that they are made available to the farm people.

County Extension staffs work with the College in adapting new practices to actual farm conditions and in proving their value through local experiments, test plots and demonstrations. The Agricultural Extension Service also serves as a major outlet for the material developed in the research work of the U. S. Department of Agriculture.

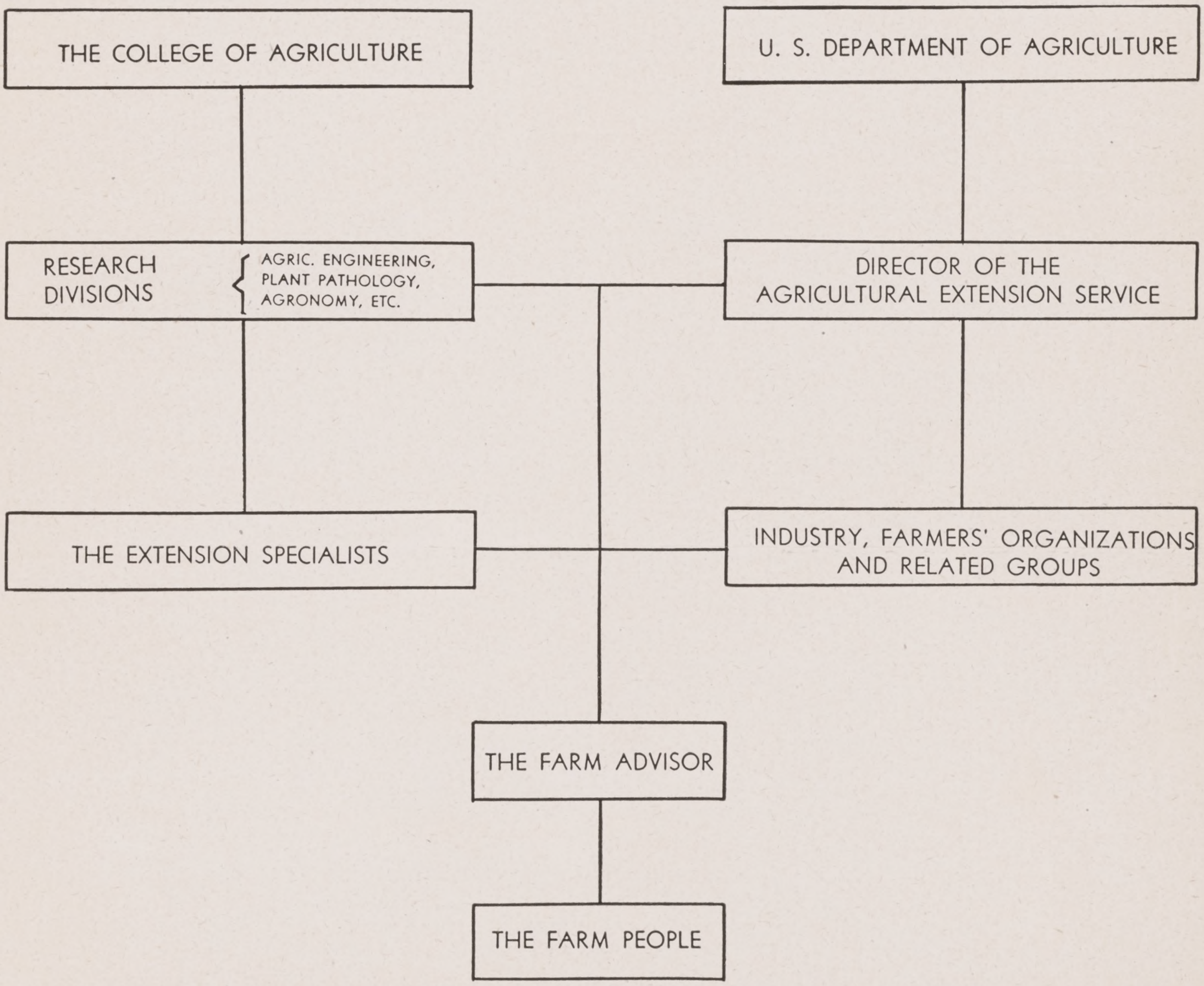
Another important feature of Extension's relationship to farm people is that of serving as a channel for the problems of farmers to the College as a basis for experimental work and expert assistance. Furthermore, the Agricultural Extension Service realizes that rural people have a great fund of knowledge based on experience, which, if assembled and made known to all farmers, would serve greatly to improve agriculture and rural life in other areas of the state.

The subject matter specialists are the direct link between the County Extension workers and the research divisions of the College. The Specialist staff maintains close contact with the research and experimental workers to obtain the results as rapidly as they become available for transmission to the county people. It is the County Farm Advisor and his assistants who maintain direct contact with the farmers and help apply research information to local problems.

A TWO-WAY FLOW OF INFORMATION

As a public agency supported jointly by federal, state, and county funds, the Agricultural Extension Service has a deep responsibility to keep its two-way flow of information open in both directions. There is as much, if not more, responsibility to relay the problems of farm people to the College of Agriculture and the U. S. Department of Agriculture as to provide new information for the farmer.

No one organization can hope to meet all the problems of farmers in an area with agricultural conditions as varied as those in California. The Agricultural Service therefore also works with many other public and private groups. In the sugar beet program, this includes the beet sugar companies, the U. S. Department of Agriculture, The California Beet Growers Association, and all farm groups and agencies dealing with the subject. The cooperative and integrated programs of all of these organizations are the foundation of success for the sugar beet grower. We of the Extension Service are therefore very conscious of our part in the overall program, for in the final analysis—it is *your* Agricultural Extension Service.


THE COLLEGE OF AGRICULTURE
U. S. DEPARTMENT OF AGRICULTURE
RESEARCH DIVISIONS
AGRIC. ENGINEERING, PLANT PATHOLOGY, AGRONOMY, ETC.
DIRECTOR OF THE AGRICULTURAL EXTENSION SERVICE
THE EXTENSION SPECIALISTS
INDUSTRY, FARMERS' ORGANIZATIONS AND RELATED GROUPS
THE FARM ADVISOR
THE FARM PEOPLE

This organization chart shows how the Agricultural Extension Service channels information to the farm people from the College of Agriculture and the U. S. Department of Agriculture. This is a two-way system, since the farm people both give and receive information.

TAIL WATER RECOVERY—AN IRRIGATION ECONOMY

By MARK RANEY, *Agricultural Superintendent*
Spreckels Sugar Company

Recovery and re-use of tailwater — water which has failed to penetrate and runs off the crop at the end of irrigation furrows—is one of the most logical steps toward greater use of the available water supply.

In addition to the actual saving in water itself, the re-use of tail water may be even more important if fertilizer such as NH_3 gas has been added to the water. Surely it is not efficient to discard a considerable quantity of expensive and scarce fertilizer.

Southern San Joaquin growers have pioneered the development of recovery systems. These usually include the construction of a sump or gathering place for the waste water, located at the lowest spot at the end of the irrigation runs. This is usually at the corner of the field, but often the waste water of several fields is gathered at one sump, if the topography of the area involved allows such a plan. Ditches similar to head or supply ditches but smaller are constructed at the low ends of the irrigation runs to allow the quick transportation of the water to the sump with a minimum of loss.

Many types of pumps are used. Usually they are self-priming centrifugals but often a small deep well type turbine is used so that the impeller can be set at the lowest point in the sump. Both electric and gasoline engine power are used. A float control can be used to start the unit when the sump starts to fill. Although this float control may be more easily installed on the electric installations, several engine units have been constructed with float controls on the throttles, thus allowing the engine to idle until the water reaches a certain height, at which time the motor is accelerated.

While many of these pumps are permanent installations, the quickly transportable type of self-priming pump is quite popular. Usually these are on wheels to facilitate moving. Larger capacity sumps may be required but these can be easily made with a bulldozer or scraper. The portable pumps are moved from field to field and placed in the sump where they are most needed.

Two types of return lines are used. Many growers have installed permanent underground cement lines, usually about 8 to 10 inches in diameter. Others, particularly with portable pumps, use light, quick coupling pipe from 4 to 6 inches in diameter. Many of these are army surplus "invasion" lines similar to the lines used for rain machines. Often the water can be returned to a stand-pipe of a nearby cement irrigation water transport line so that the purchase of an extensive amount of additional pipe is not required.

Costs of these installations depend, of course, on many factors. War surplus pump engine combinations capable of an output of 500 or more gallons per minute have been purchased for between $500.00 and $600.00. These are usually high pressure centrifugals originally manufactured for fire fighting. Small portable sump pumps are less costly, but usually have less capacity. Small electric turbine pumps capable of pumping 500 to 1,000 gallons per minute cost from $750.00 to $1,000.00 including installation. Naturally, the lift and head involved enter into the output and cost.

Tail water recovery has become standard practice in the Southern San Joaquin Valley—other sections may well accept this practical system of water economy.

BEET TOP RECOVERY

(Continued from page 34)

Enough of this beet leaf meal has been produced experimentally to be used in feeding trials of poultry to prove it equal to alfalfa meal. In these trials beet leaf meal replaced alfalfa meal 100 per cent.

At the termination of our harvest and feeding season we shall have available concrete facts and information concerning these various systems of top harvest. It will then be possible to evaluate and appraise each method of beet top recovery, publish the comparative data, and permit each beet grower to select the system which best fits his local field and feeding conditions.

WHAT'S AHEAD

(Continued from page 37)

From the foregoing it will be seen that the Secretary of Agriculture has a monumental job on his hands as administrator of the Sugar Act. So also could it be said of anyone who would attempt any long range forecast of events in the sugar market.

Nevertheless, we are so completely convinced of the economic merit of sugar beet production that we confidently predict sugar prices reflecting returns to sugar beet growers, which will permit profitable production to continue indefinitely into the future.

Meantime, technologists maintain unceasing and progressively successful efforts to step up the efficiency and quality of production. Statistics reflect substantial gains during the past decade and foreshadow even greater achievements in the future.

Heretofore sugar beets have been considered as a single crop, utilizing only the roots for processing into sugar. Recently, however, increasing attention is being given to the commercial development of their second crop value —the recovery and sale of the tops and crowns for livestock feed. We predict that within the next few years this second crop from sugar beets will add very substantially to net grower returns.

Finally, we predict that the value of sugar beet production will be so thoroughly demonstrated in the immediate years ahead that acreage planted will be limited only by the combined capacity of the beet sugar factories located in the state, or by such restrictions as may be imposed from time to time by the terms and conditions of the Sugar Act of 1948, or successor legislation.

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

Editor
AUSTIN ARMER
600 California Fruit Bldg.
Sacramento, Calif.

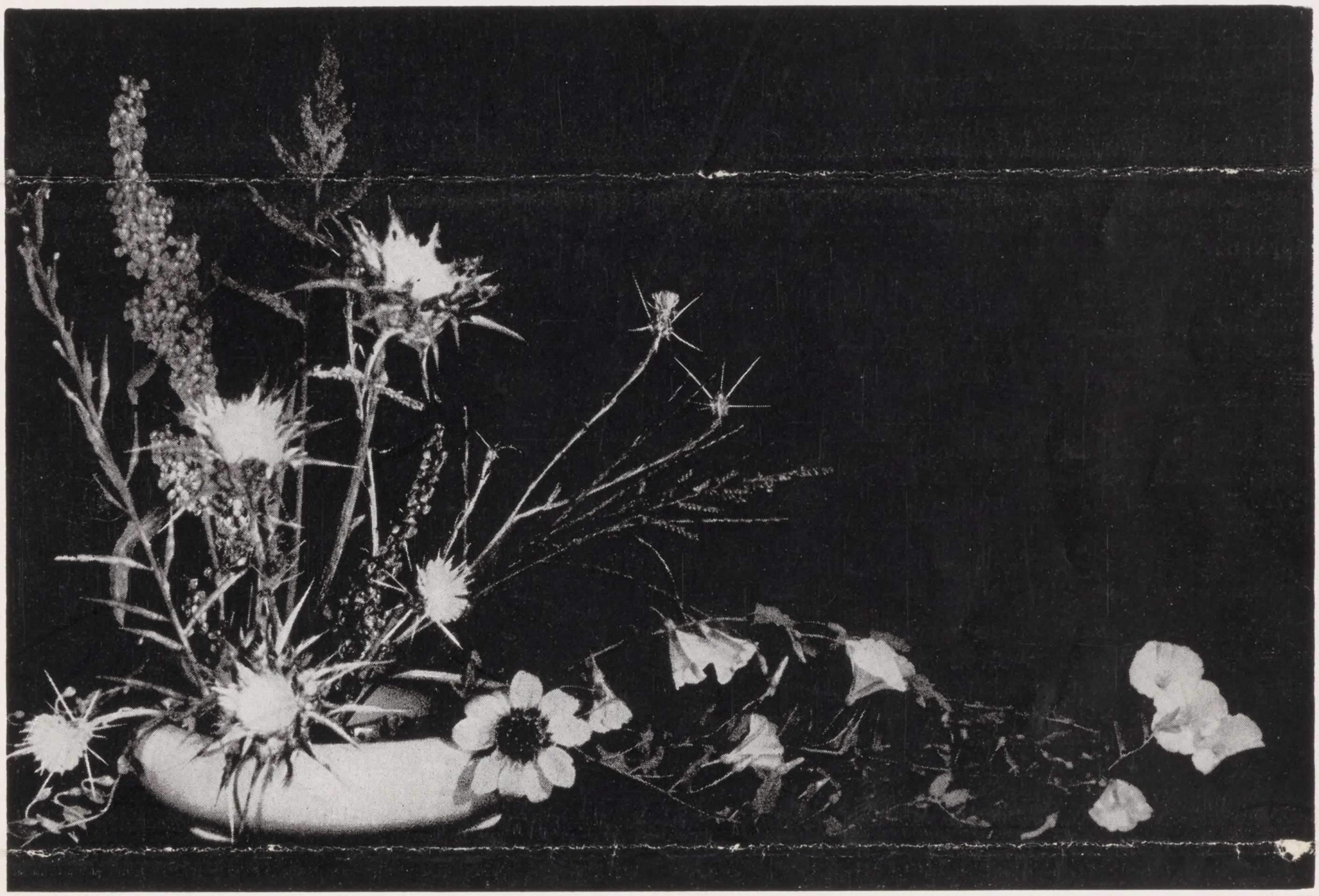
Associate Editor
NAIDA BECKETT
2 Pine Street
San Francisco, Calif.

SALINAS PUBLIC LIBRARY

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

Vol. XII NOVEMBER - DECEMBER, 1948 No. 6



35

MORE COSTLY THAN ORCHIDS

California beet growers pay $7,500,000 a year for weeds. A fourth of their gross income is consumed by

HOEING COSTS
CULTIVATION COSTS
GROWTH COMPETITION

Judicious and timely weed control is essential to maximum profits. Now is the time to plan for the 1949 weed control program.

HONEY-DEW

CHEMICAL WEED CONTROL

By R. G. VEACO

Field Superintendent, Spreckels Sugar Co.

Editor's Note: The Spreckels Sugar Company conducted widespread experiments on pre-emergence spraying during the spring of 1948. Mr. Veaco was project leader on these experiments, and his report is here reproduced. We believe it presents an accurate picture of our pre-emergence weed control experience.

Woodland, California, August 24, 1948.

From: R. G. Veaco

To: Mr. G. D. Manuel

Enclosed you will find the results of our pre-emergence spraying experiments. We have attempted to answer the following questions:

1. Under what conditions should pre-emergence spraying be undertaken?
2. What spray materials should be used?
3. How and when should the spray materials be applied?

While executing this experiment, it was found that parts one and three were as important as part two in the overall problem. Such conditions as soil texture, weeds, and weather vary greatly. Only when all factors approach the optimum should spraying be undertaken.

In order to gain more complete understanding of the tabulated results, it was necessary to record all observations and to make a layman's study of the materials used. A discussion of these findings follows:

CONSIDERATION OF PRE-EMERGENCE SPRAYING PROBLEMS

A. The Nature of the Weed Problem.

1. Weed Types Involved.
   a. When spraying is done in the early part of the year, nearly all types of weeds will be killed or severely retarded.
   b. If spraying is done late in the year, such weeds as purslane, morning glory, yellow star thistle and dog fennel will be encountered. These are more tolerant of oil sprays.
2. Stage of Growth of Weeds.
   Since the extent of the kill is proportional to the coverage, the weeds should be sprayed in the seedling stage. As the weeds increase in size, the application of spray material should be increased to insure complete coverage. Care must be taken not to spray prematurely before all of the weed seedlings have emerged.
3. Susceptibility of Weeds to Toxic Materials.
   The materials used in these experiments were sufficiently toxic to kill all weeds on which coverage was complete and contact was persistent. In general, it may be said that broadleafed plants succumb more readily than grass plants. Such plants as Bermuda grass, nut grass, or morning glory, can only be retarded in their surface growth.

B. The Nature of the Soil Problem.

1. Soil Texture.
   a. Heavy Soils. The heavy soils of the Woodland area do not readily lend themselves to pre-emergence spraying. Application of sprays is usually made at a time of year when alternate heavy rains and drying winds are the rule. Following such conditions, the land must be reworked before a good seed bed can be obtained.
   b. Light Soils. Sandy or peat soils are well adapted to pre-emergence spraying. The near absence of crusts makes it possible to retain a good seed bed for long periods of time.
2. Moisture Conservation.
   Pre-emergence spraying may be used to good advantage where moisture conservation is essential and a weed problem exists.
3. Depth of Planting.
   Planting depth should not be less than about one inch. At depths greater than one inch, moisture conditions, soil texture, and weather should be considered the controlling factors rather than the residual qualities of the spray material.

C. Effects of Weather on Pre-Emergence Spray Materials.

1. Warm Weather Increases Effectiveness of Sprays.
   Warm humid weather prevailed for the experiments at Lockeford and Woodland. Within a few hours after spraying, most of the weeds showed damage. It is believed that heat increased the effectiveness of the spray and that humid weather decreased the evaporation, thus allowing the toxic materials to remain on the plant longer.
2. Cool Weather Decreases Effectiveness of Sprays.
   During the experiment at Terminous relatively cool weather prevailed. Less quick damage to the weed seedlings was observed. In the evening, a steady breeze blew which may have increased the evaporation of the materials.

A CONSIDERATION OF THE MATERIALS USED

A. Diesel Oil.
The Study of oils as herbicides is a field in itself and no attempt will be made to cover it here. However, it must be stated that diesel oils have two qualities which make them desirable as herbicides; their ability to "wet" or spread out thus giving coverage and their toxic effects on plant life. The toxic qualities of diesel oils vary with the degree of refinement and the specific purpose for which they are designed.

B. Commercial Oils Manufactured Specifically as Herbicides.
These "hot" oils are largely composed of the by-product of the highly refined diesel oils. Such oils

(Continued on page 45)

CONTROL OF WEEDS ON FENCE LINES AND DITCH BANKS

By W. A. HARVEY

Botany Division, College of Agriculture, University of California at Davis

Within recent years it has become common practice for farmers to spray for control of weeds in many crops. However, it is not unusual to find such weed control practices carried only to the end of the crop row, leaving the fence lines and ditch banks infested with weed pests. The seed from these areas may be spread by wind, water, or animals to reinfest the crop land. Not only may such weeds serve as a seed source but they may also harbor insects and plant diseases that affect the crop. Both the curly top virus and the beet leaf-hopper which spreads it, may live over on weedy plants, when there are no beets in the rotation, and cause troubles later. This is by no means the only disease or insect which carries over on uncontrolled weeds. Thus to cut down losses from weeds on any farm, it is necessary to control them on the uncropped areas as well as on the crop land.

CONTROL METHODS

Many methods are available for controlling weeds on fence lines and ditch banks but the choice of method is no more important than the decision to do something and to do it at the right time. Keeping ahead of the weeds is the hardest part of the task and the key to the whole program. Once the weeds are allowed to grow large or go to seed, the problem is more difficult and many times more expensive.

The complete elimination of fence lines has gone a long way toward solving this part of the problem on California farms. It is not uncommon to find large areas on which the fences have been completely removed, allowing cultivation to the road shoulder. Where such a method is possible, it is probably the cheapest way to keep down weeds. On dry farmed fields two spring cultivations or discing will often be sufficient. On irrigated lands, ditches will often interfere with cultivation and each irrigation may bring on a new crop of weed seedlings.

Mowing of weeds is a not uncommon practice but rarely will mowing alone handle the problem. It is impossible to get all the weeds in the fence line or on ditch banks by mowing. Some of the worst weeds will go to seed even when repeatedly mowed by lying flat on the ground below the mower blade. If mowing is the only method at hand it is necessary to watch the weed growth and mow well before any seeds are formed. Some of our weeds will mature seed on cut plants.

Burning is another method of weed control that must be carefully timed and faithfully carried out if it is to be of value. Burning mature weeds will destroy some of the seed and improve the appearance of the fence line or ditch bank but will seldom control the weeds effectively if used as the sole method of control. Several large irrigation districts use burning to advantage by setting up a definite program and going over the ditches several times a season. On green weeds a quick burn or searing, followed in a few days by another burn is both cheaper and more effective that attempting to burn completely on the first time over.

Most farmers are now familiar with spraying to control weeds and would probably prefer to handle the fence lines and ditches in this way. There are numerous chemicals available but, again, the most important consideration is to spray when the weeds are small. The chemical to use will depend on the weeds present, the equipment available, and also on the neighboring crops.

WHICH SPRAY MATERIAL?

It has long been common practice in California to spray with diesel oil for general weed control. Within recent years such oil is being more highly refined so that it may be no longer an effective weed killer. At the same time that the weed killing properties of diesel have been decreasing the price has been increasing. At present diesel oil is neither an effective nor an economical material when used alone. The major oil companies have filled the demand for a higher toxicity oil by providing special weed killing oils with controlled composition so that they do not vary from batch to batch. These new oils, while highly effective, are usually more expensive than

(Continued on Page 46)

36

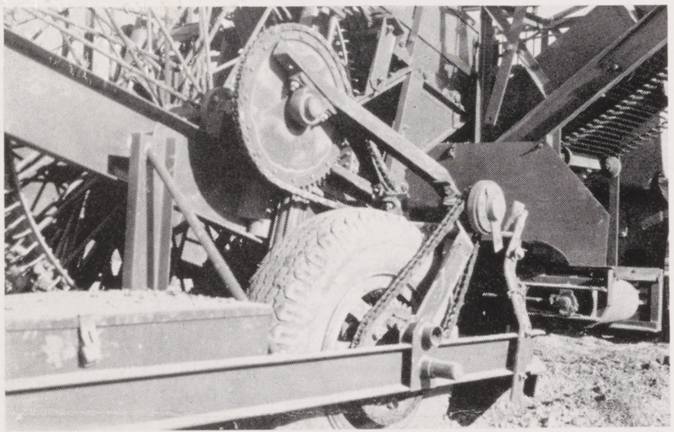
The fence line along this beet field is a perpetual breeding ground for weed seed. It also reduces the useful acreage of the enclosed field, and is an obstacle to cultural operations.

37

This field is farmed right up to the property line. The absence of a fence not only facilitates weed control, but increases the useful acreage.

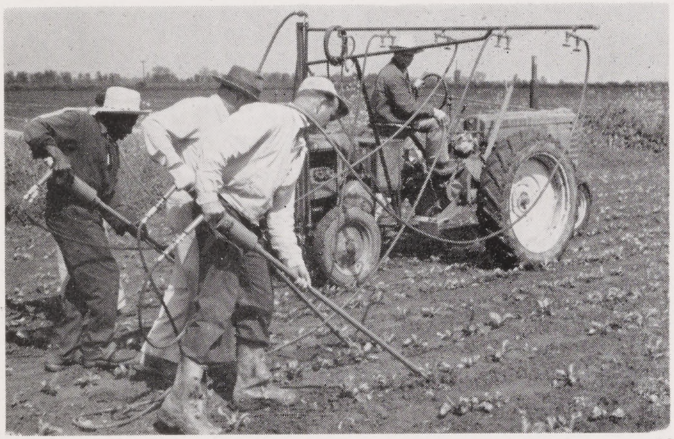
GADGETS, GIMMICKS AND GIZMOES

Photographed By AUSTIN ARMER
Agricultural Engineer, Spreckels Sugar Co.



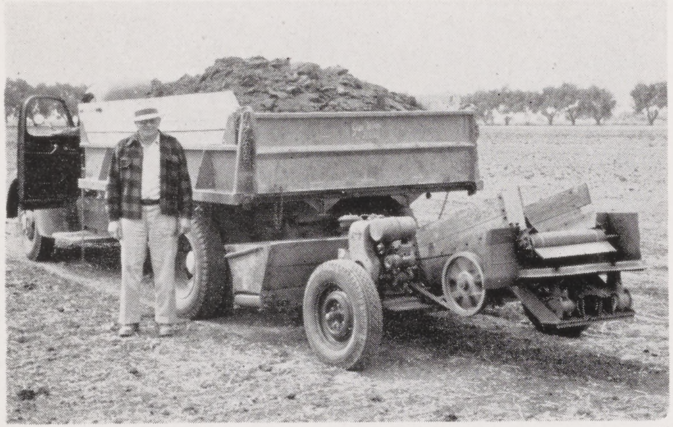
38

Joe Gomez, of Greenfield, has been working with sugar beet mechanization for many years. This ground wheel drive for the two-row Marbeet spiked wheels contributes toward better pickup and more accurate topping. Mr. Gomez has sold many of these units to Marbeet owners.



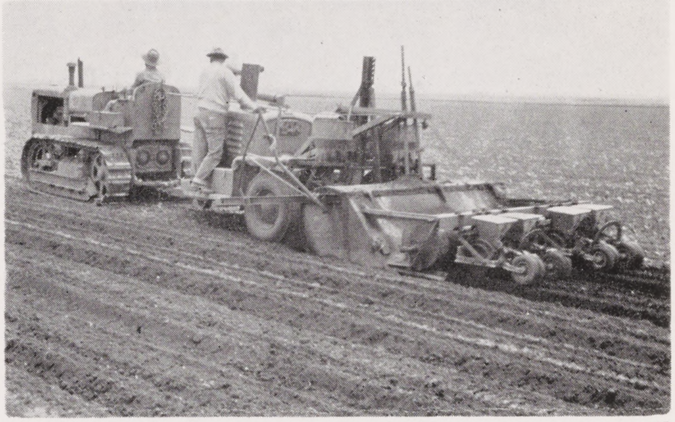
39

Frank E. King, who grows beets in the Woodland area, makes compressed air his hobby. Among the many compressed air devices which he uses on his ranch, this pneumatic hoe is probably the most spectacular. Four of these hoes are shown here in one of Mr. King's beet fields.



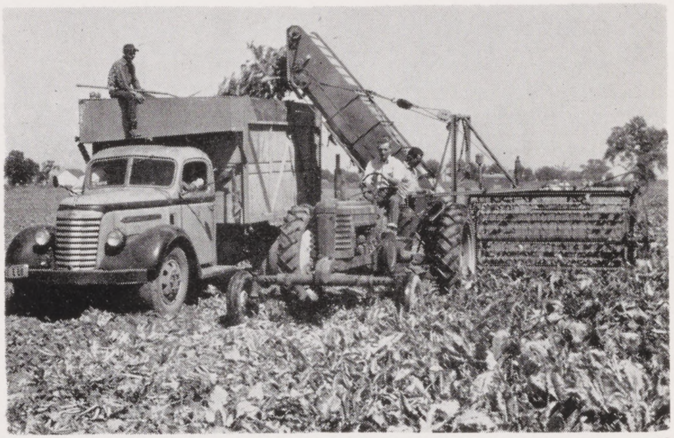
40

Wayne Armstrong is a trucking contractor who likes to do things his own way. In order to use his standard dump trucks for manure hauling and spreading, he built this truck-trailed manure spreader, powered by its own 4-horse power engine.



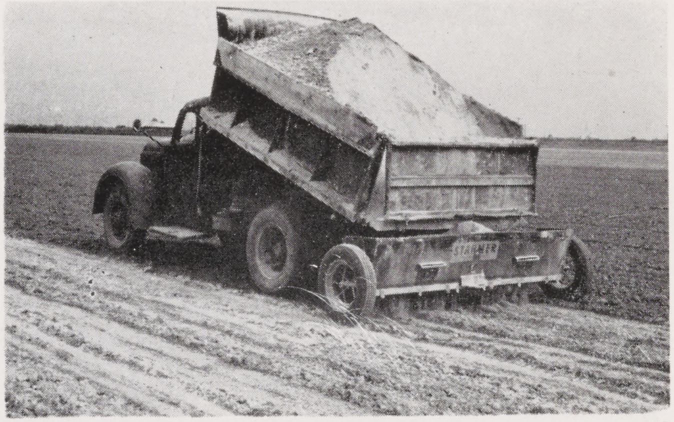
41

K. B. Fisk realized his dream of harrowing, bed forming, fertilizing and planting all in one operation when he built this machine around a Seaman tiller. Following the tiller's soil pulverizing action, this machine forms ridges, applies commercial fertilizer and precision plants beet seed on four rows.



42

Neil Locke developed the Green Crop Harvester which was described in the September-October issue of the Spreckels Sugar Beet Bulletin. This picture shows the machine harvesting sugar beet tops for ensilage.



43

Wayne Armstrong's trucks may be hauling manure one day and lime the next. Rebuilt in Mr. Armstrong's own shop, this commercial lime spreader was reinforced and adapted to hitch directly behind a dump truck.

SPRECKELS SUGAR COMPANY ANNOUNCES STAFF CHANGES

GUY D. MANUEL was appointed General Agriculturist for the Spreckels Sugar Company, in charge of the agricultural staff, effective October 1, 1948. For the present, Mr. Manuel will continue to make Sacramento his headquarters.

MARK G. RANEY, Agricultural Superintendent at Bakersfield has accepted a position with the Kern County Land Company as Superintendent of Ranches. His position as Agricultural Superintendent in that area will be filled by WALTER H. BUCKINGHAM, JR., formerly of the Woodland district. He will be assisted by RAY TALCOTT, Field Superintendent, and ERNEST UNRUH, Implement Yard Foreman.

JOHN M. LEAR has moved his desk to the Sacramento office. He will assume the duties of Assistant Agricultural Superintendent, and will continue his work as Livestock Specialist.

F. JACK HILLS has moved to the Sacramento office as Agricultural Research Specialist. This new job supersedes his work as Field Superintendent in the Bakersfield district. His full time will be devoted to studies of yield and sugar content problems.

ROBERT G. VEACO, Field Superintendent, will now serve growers in the King City area, while RICHARD L. PEDDER, formerly of King City, will be stationed at Woodland as Field Superintendent.

N. KENNETH GROEFSEMA, heretofore engaged in experimental work, has been made a Field Superintendent and will continue to headquarter at the Woodland office.

WILLIAM DUCKWORTH, who has been assisting in plant breeding work at Spreckels, has moved to Woodland as Assistant Field Superintendent.

DON'T YOU BELIEVE IT!

Beet growers are human. Like all humans, they find comfort in accepting traditions, and are apt to resent the glaring light of truth when it reveals the falsity of these traditions.

The Spreckels Sugar Company believes that false traditions should be corrected when they become so firmly rooted as to interfere with grower profits. Accordingly, we present a few of these "Old Wives' Tales," along with the corresponding truths.

Delay the first irrigation — the plants grow long tap roots in their search for water.

Don't you believe it! Any lack of adequate soil moisture has only one effect — to damage or destroy hair roots and inflict injury to the plants from which they never fully recover.

When hand harvesting, plow out beets several days before topping and loading. This brings up the sugar.

Don't you believe it! The loss of water by evaporation decreases the weight of beets and consequently increases the *per cent sugar.* But the *sugar per acre* decreases seriously — and so do total payments to growers.

Mechanically harvested beets have less sugar than hand harvested beets.

Don't you believe it! Mechanically harvested beets are delivered without delay direct from field to factory. Having no time to wilt and lose moisture the *per cent sugar* is less than if the beets had been hand harvested. But the *sugar per acre* is higher by a considerable margin, and *sugar per acre* is what the grower gets paid for.

When a beet is bruised, and the bruise turns red, that beet contains a high sugar percentage.

Don't you believe it! The color changes on freshly cut beet tissues are due to oxidation or enzyme effects, and have no relation whatever to sugar content.

Big seeds produce big beets.

Don't you believe it! This would violate basic genetic principles. Furthermore, repeated trials have disproved any correlation between seed size and beet size.

Beet Sugar is inferior to cane sugar.

Don't you believe it! Cane sugar and beet sugar are identical. Both are sucrose ($C_{12}H_{22}O_{11}$). Spreckels Honeydew Sugar is 99.85 percent pure sucrose — contains one fourth the impurities of the classical $99\frac{44}{100}$ percent.

CHEMICAL CONTROL

(Continued from page 42)

must be viewed with caution because of reported residues that may remain after emergence of the beets. All of the treatments showed this affect at Lockeford. However, no such effect was observed at Terminous.

This type of damage severely retards the growth of the beet seedlings. They are characteristically tough, short, and shiny leafed.

C. Di-Nitro Compounds.

Different materials react differently in their toxicities to plants. In general, toxicity may be divided into two categories.

1. Acute Toxicity Caused by Low Boiling Unsaturated Oils.

   This injury results in rapid burning of the plants, but due to the high volatility of the carrier, it is not persistent.

2. Chronic Toxicity Caused by High Boiling Unsaturated Oils.

   This is the characteristic toxicity of diesel oil. It is slow in its action, but may persist on the plant for several days.

When an oil soluble di-nitro compound of high acute toxicity is combined with an oil of chronic toxicity the killing power of the latter is highly enhanced.

D. Emulsifying Agents.

An emulsifying agent is usually a straight chain organic compound of which one end is oil soluble (an alcohol) and the other end is water soluble (a sodium or like atom).

Commercial manufacturers offer a limited number of products and the most common emulsifiers are soaps or household detergents.

(Continued on next page)

(Continued from preceding page)

OBSERVATIONS ON APPLICATION OF MATERIALS

A. Orifice Size Versus Pressure.

In general, it is better to keep the orifice size as large as possible and the pressure as low as possible to give the desired quantity.

As the pressure increases, the droplet size decreases. Small droplets are more subject to drift than are the larger droplets. However, if the droplets become too large, they tend to roll off the plant, thus wasting the material.

B. Angle Settings of the Nozzles.

More complete coverage is obtained if the nozzles are staggered about 20 degrees fore and aft of the vertical. Since there is considerable overlapping of the spray fans, one nozzle will hit the weeds from the bottom up and the other will hit from the top down.

C. Time of Application with Reference to Planting.

1. If spraying is done after planting. The time of application with reference to planting is extremely critical. Little is known about the residual qualities of some of the commercial oils used in pre-emergence spraying. For this reason, it is highly important to spray as soon as possible after planting.

2. If spraying is done before planting.

   In some cases planting was accomplished as close as four hours after spraying. This had the following advantages:

   a. Complete coverage of the weeds in the row was obtained.

   b. A maximum of time was allowed for residues to escape before emergence of the beet seedlings.

   c. Had the weather conditions been adverse, no beets would be left unsprayed. The prime disadvantage lies in the fact that undoubtedly some seeds came in direct contact with the toxic materials.

In carrying out this study, reference was made to the following:

1. Hilgardia: January 1948. Herbicidal Properties of Oils by A. S. Crafts and H. G. Reiber.
2. Weeds of California by W. W. Robbins, Margaret K. Bellue and Walter S. Ball.
3. California Extension Service Circ. 97. Weed Control by W. S. Ball, A. S. Crafts, B. A. Madson and W. W. Robbins.
4. Spreckels Sugar Beet Bulletin: November, December 1947.

(Signed)

R. G. VEACO
Agricultural Department
Spreckels Sugar Company.

WEEDS ON FENCE LINES

(Continued from page 43)

diesel. This can be taken care of in part by spraying when the weeds are small with low volumes. Small weeds, 4 inches high or less, can often be covered with 50 gallons per acre but larger weeds may require several hundred gallons per acre which makes the cost prohibitive. As a method of reducing the cost of the spray and at the same time getting coverage of all the weeds, emulsions of oil and water plus a fortifier have come into use. The amount of oil to use in the mix will depend on the grasses present. If there is only a little grass in the stand of weeds, a low per cent of oil (perhaps 10 per cent) may be sufficient. If grasses are the predominant weeds, more oil will be required. The fortifier may be a dinitro material, of which there are several on the market, or penta - chlorophenol. The amount of fortifier to use will depend in part on the particular product and the manufacturer's recommendations may be followed. The amount of mixture applied per acre should be enough to give good coverage or wetting of the weeds with little or no run-off. Thus it is necessary to be sure of three things: (1) enough volume to wet all the weeds; (2) enough fortifier to kill all the weeds; and (3) enough oil to give coverage and kill of the grasses.

It is obvious here that small weeds are easier and cheaper to kill. No one formula will fit all situations and even on the same ranch the mixture will probably need to be changed, depending on the weeds and the season. Heavy stands of perennial grasses such as Johnson grass or Bermuda grass can probably best be handled by repeated sprays using one of the special weed oils undiluted.

In addition to the oils and emulsions mentioned, there will be places where 2,4-D can be used to advantage. Many of the broad-leaved weeds can be killed with 2,4-D but most of the grassy weeds are unaffected. It is common to first spray with an oil emulsion, then if there is regrowth of broad-leaved weeds such as morning-glory or yellow star thistle, follow up with 2,4-D. Be extremely careful not to spray or allow spray drift on sensitive crop plants. Crops such as tomatoes, melons, cotton, beans, grapes and some fruit and nut trees are extremely sensitive even to small amounts of 2,4-D drift. The sprayer should be carefully cleaned before it is used to spray crops again.

A more costly method but a more lasting one is the use of a soil sterilant such as borax or sodium chlorate or a mixture of the two. Such treatment is especially useful around irrigation structures, buildings, roadsides and other non-crop areas. The materials can be applied dry or as a liquid spray.

Not all the methods mentioned here will be applicable on every farm but one or more of them can be used to advantage on almost every farm. The most important step is the decision to do something about the weeds on the fences and ditches. Then, by starting ahead of the weeds and getting them while they are small, you can clean up these areas.

SPRECKELS SUGAR BEET BULLETIN

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

INDEX TO VOL. XII, 1948

ISSUE	PAGES
January-February	1- 8
March-April	9-16
May-June	17-24
July-August	25-32
September-October	33-40
November-December	41-46

SEED AND PLANTING

TITLE	AUTHOR	
The Spreckels Sugar Beet Breeding Program	W. B. Marcum	10
Steps in the Production of Processed Sugar Beet Seed	Lambdin and Buckingham	10
Spreckels Will Treat All Seed Issued to Growers	Austin Armer	11
Planter Settings and Recommendations for Processed Seed	Buckingham and Kendrick	13

IRRIGATION

Plant and Soil Moisture Relationships Important to the Sugar Beet Grower	Jack Hills	18
Effect of Lower Water Tables on Pumping Plant Capacities	Joseph K. Cannon	18
Aids to Irrigation Economy.	W. L. Gerow	20
Some Reasons for Variations in Irrigation Practice	C. N. Johnston	22
Relative Water Requirements of Various Field Crops	Norman Vogt	24
Tail Water Recovery — An Irrigation Economy	Mark Raney	39

WEED CONTROL

Chemical Weed Control	R. G. Veaco	42
Control of Weeds on Fence Lines and Ditch Banks	W. A. Harvey	43

SUGAR BEET BY-PRODUCTS

The Industrial Utilization of Sugar and Byproducts	Dr. Robert C. Hockett	2
Beet Top Recovery Becomes a Major Experimental Program	John Lear	34
Methods and Machines for Beet Top Recovery	Austin Armer	34

MACHINERY

The 1947 Mechanical Harvest in Review	Austin Armer	3
Fuels and Lubricants for Auxiliary Engines	L. M. Rorden	26
Proper Hardfacing for Longer Marbeet Plow Life	Phil Welty	27
Harvester Improvements for 1948	Blackwelder, Hipple	28
Mechanical Harvesting in Weedy Fields	Austin Armer	29
Methods and Machines for Beet Top Recovery	Austin Armer	34
Gadgets, Gimmicks and Gizmoes	Austin Armer	44

GENERAL

World Sugar Production and Importance of U. S. Sugar Act	B. H. Benidt	2
Land Levelling for Maximum Sugar Beet Production	R. T. Marvin	5
More Money for Your Beets	Ronald Hayes	6
The Automatic Polariscope — A Spreckels Research Achievement	R. A. McGinnis	14
The Importance to the Grower of Delivering Clean Beets	William Conner	30
What's Ahead for Sugar Beet Growers	Gordon Lyons	37
50th Anniversary Campaign Successful	Editor	38
Your Agricultural Extension Service	Wayne F. Weeks	38
Don't You Believe It	Editor	45
Spreckels Sugar Company Announces Staff Changes	Editor	45

The SPRECKELS SUGAR BEET BULLETIN is published bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.

Editor
AUSTIN ARMER

600 California Fruit Bldg.
Sacramento, Calif.

SALINAS PUBLIC LIBRARY

SPRECKELS SUGAR COMPANY

Incorporated August 6, 1897

Two Pine Street
San Francisco 11, California

Authorized Capital Stock	$12,500,000.00
Capital Stock Outstanding	9,000,000.00

C. J. Moroney	President and Director
J. E. Coke	First Vice-President and Director
H. Beach Carpenter	Director
Charles de Bretteville	Director
Carl F. Huttlinger	Director
Bruce Kelham	Director
G. Vincent Pach	Director
J. N. Rosekrans	Director
Ralph S. Stubbs	Director
W. J. Resch	Vice-President and General Superintendent
E. L. McKeany	Vice-President in Charge of Sales
E. H. Kellberg	Secretary
C. A. Thulander	Treasurer
K. A. Kincade	Controller
P. W. Alston	General Chemist
W. K. Gray	Chief Engineer
W. H. Ottey	Sales Manager
G. P. Wright	Salinas District Manager
H. F. Melvin	Sacramento and San Joaquin District Manager
O. H. Dersheimer	Industrial Relations Director

SPRECKELS SUGAR COMPANY FACTORIES

	SPRECKELS CALIFORNIA	MANTECA CALIFORNIA	WOODLAND CALIFORNIA
Erected	1899	1917	1937
Daily Capacity (Tons of Beets)	5,300	1,875	2,350
Superintendent	Ira A. Resch	A. A. Norman	W. W. Conner

SALINAS PUBLIC LIBRARY
3 3550 03201 0212

HONEY-DEW